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The AUTOMOBILE

Vol. XXXVI
No. 14

NEW YORK, APRIL 5, 1917

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Three dollars a year

Accelerating America

What a wonderful stimulus to our nation the motor vehicle has proved! In city and country, in business and pleasure, it has enlarged our opportunities and quickened our very lives.

This contribution to our spirit of progress has been largely made possible by the Continental Motor. For more than 250 models of automobiles and motor trucks, this world-famous motor in its various models provides the power plant. Because of its firmly established reputation with hundreds of thousands of owners, the Continental Motor everywhere inspires confidence in prospective buyers. It truly accelerates the motor vehicle industry, and thus furthers our nation's progress.

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Michigan
Factories: Detroit—Muskegon

Largest exclusive motor manufacturers in the world.

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Stewart PRODUCTS

Stewart Speedometer

$25

Warner Auto-Meter

$50

Quick Sales! Quick Profits!

That is what dealers get with Stewart Products.

A rapid turnover of your accessory stock means quick profits. This means bigger profits for you.

It isn't so much what profit you make on an article as it is the quantity you can tell. For example, it is better to sell four signals of a known brand, in a certain period, at a profit of one dollar each, than to sell one unknown signal at a profit of one dollar and fifty cents.

To be profitable your accessory department must be stocked with quick sellers—articles that are well known, widely advertised and easy-to-sell.

Stewart Products are the fastest-selling and easiest-to-sell of all automobile necessities. That is why they are so profitable for dealers to carry.

Stewart Products are backed up by an enormous advertising campaign—bigger than any other in the field.

Stewart Products are more than half sold when placed on your shelves. A big demand exists. You don't have to spend a lot of time trying to move Stewart Products. Stewart advertising and Stewart prestige do it for you.

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It is a line that is progressing—advancing by leaps and bounds.

Fast sellers—business builders for you—are being added to the line continually.

TWO NEW STEWART PRODUCTS

will be announced next week. Something new. Something big. Just what you need—what you have been waiting for. You simply must take advantage of this new opportunity. Be sure to read the announcement on this page next week.

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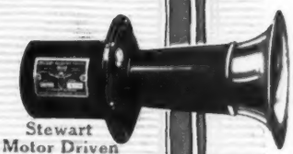

Stewart Motor Driven Warning Signals

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Stewart Tire Pump

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Stewart Instrument Board for Ford Cars Complete

$11.25

The AUTOMOBILE

VOL. XXXVI NEW YORK—THURSDAY, APRIL 5, 1917—CHICAGO NO. 14

The War Manufacturer's Motto: We will sell to the National Government all services, commodities and inventions required by it at prices which will yield a profit no greater than would be received in similar transactions with private customers

War Crisis Finds Industry Prepared

N. A. C. C., S. A. E., Rubber Assn., A. A. A., Aero and Motor Truck Clubs in Constant Co-operation with the Government for Defense

NEW YORK, April 4—The present war crisis finds practically the entire automobile industry in a state of practical preparedness on a more perfected scale than practically any other line of industry in the country with the exception of munition manufacturers, who have been filling war orders for over 2 years. Some weeks ago the National Automobile Chamber of Commerce went on record as pledging the fullest co-operation with President Wilson, the 101 members further pledging themselves subject to call of the authorities at Washington for any emergency and placing their factories, equipment and resources at the disposal of the government.

S. A. E. Is Ready

For many months the Society of Automobile Engineers, through a division of its Standard Committee, has been co-operating with the War Department in drafting specifications for army motor trucks, and other matters pertinent thereto. The society has also been working in connection with the Bureau of Standards and other government departments.

The Rubber Assn. of America has for nearly 2 years closely linked up in war matters, having charge of practically all crude rubber entering this country since the agreement with Great Britain 2 years ago. During that time its clerical organization has been in operation and the rubber factories have been so close to the government that they are now completely under Federal guard. Some of the largest Akron tire factories have been inventoried by the government and employees enlisted at these factories for manufacturing purposes. One of the large Akron factories is engaged in manufacturing dirigible parts for army purposes and another has started educational classes for military training among its employes.

The Motor Truck Club of America, which is largely a New York organization of truck owners, has been particularly active for weeks in indexing motor trucks in the Greater New York area, and demonstrated how prepared it was to carry its plans into practical operation when last Sunday it moved the complete mechanical equipment, stores, ammunition, rifles, etc., of one of the New York regiments from the city to a point inland in the state.

As yet the Motor and Accessory Manufacturers have not taken any steps toward co-operating with the government, but a large number of the individual members of the association have placed their factories at its disposal.

Representatives in Washington

To-night several of the official representatives of these organizations leave for Washington, where they will consult to-morrow with the War Department and the Council of National Defense on transportation matters. General Manager Alfred Reeves of the National Automobile Chamber of Commerce; Coker F. Clarkson, general manager of the Society of Automobile Engineers, and President Roderick Stephens of the Motor Truck Club of America will head the representatives. It is expected that these men will discuss the plan for mobilizing motor trucks for army use. The scope of the plan is national and it has been worked out on a practical basis so that motor truck equipment to transport troops, munitions, etc., can be quickly arranged for in any section of the country.

Aero Club Active

For 2 years the Aero Club of America has been bending every effort toward increased efficiency of the flying corps of our army and navy. A national aero fund was collected for furnishing the necessary equipment and facilities in this work, the amount received totaling several hundred thousand dollars. At present the club is overwhelmed with recruits for potential flying units, many wealthy young men training themselves and furnishing their own aeroplanes. Training of other recruits who are accepted is carried on at government schools. Coast patrol units are being organized and the Aero Club is co-ordinat-

(*Continued on page* 669.)

S. A. E. War Plans Complete

Preparedness Committee Active in Washington—Membership Campaign for Service

NEW YORK CITY, April 4—The Society of Automobile Engineers has its plans well laid for co-operation with the national government on all matters of defense. It is over a year ago when the society pledged itself to support the government in all matters of this nature. In order to not get its efforts confused or to have conflict with other organizations, the preparedness committee was appointed at the last meeting of the council held in Atlantic City.

It consists of President George W. Dunham, Vice-President J. G. Vincent and Past-President W. H. VanDervoort, and is in touch with the Council of National Defense and the government departments, Mr. VanDervoort being stationed at Washington, while President Dunham and Mr. Vincent are ready to leave for the capital at a moment's notice. Besides this committee, which will have charge of the society's activities in Washington, a general committee has been appointed, consisting of a prominent member in each manufacturing city where the society is represented. Members of this committee take charge of the work in their respective territories and report to the society.

On March 30 the S. A. E. mailed a questionnaire to all its members requesting information in regard to nationality, education, present occupation and qualifications for service in a technical capacity either in connection with government operation of factories or field work. Within 3 days returns have been received from over 50 per cent of the members of the society, the replies coming in by hundreds each day. This system of card indexing is part of the campaign to locate each man where he will be of most value in the general scheme of military organization.

Develop Truck Standards

The truck standards division of the society has been working with the quartermasters department of the War Department in developing specifications for standard military transport trucks, which will go into effect July 1, the beginning of the next government fiscal year. These specifications are already well advanced. The revision of present government specifications, as made by the War Department motor transport board, has been submitted to the truck standards, electrical equipment and springs divisions of the S. A. E. standards committee, insure efficient operation of industrial resources in time of war as well as organizing men and facilities for war service so that each man will find the work for which he is best fitted. The society realizes that the industrial and technical side of modern warfare is the most important factor to be considered and is striving to insure the nation of the conservation and right employment of the men who are best qualified to produce results in this field. At a recent meeting of the marine division of the standards committee the specifications issued by the Navy Department for motor boat engines and fittings were discussed, and it was decided that the subject of storage batteries for motor boats should be studied in detail, the division recommending that the motor boat interests appoint an engineering committee to represent them on the starting battery division of the standards committee and that all members of the division submit detailed information in regard to the storage batteries they are using. The matter of reverse gear standardization for navy work was also investigated.

Four General Activities

Some of the general activities of members of the S. A. E. in event of war will be: 1—To build engines for submarine chasers through affiliation with marine engineers; 2—To build aeronautical engines through affiliation with aeronautical engineers; 3—To build motor convoys and transports; 4—To man them if necessary. Thus the S. A. E. will serve the country on land, air and water.

—

Practical Co-operation By Truck Club

Moves Equipment and Supplies of a Regiment 65 Miles in 1 Day—Other Activities

NEW YORK, April 2—Practical co-operation is being carried out by the Motor Truck Club of America, which besides co-operating with the National Automobile Chamber of Commerce on truck mobilization, has been active in other ways. The committee formed by the club to offer a list of vehicles available for military service at the time of the Mexican trouble last Spring is still in existence and the government can avail itself of these trucks by paying for them at a rate to be determined by a government inspector, either an army officer or otherwise. The club is preparing a schedule of trucks available for hire by the quartermaster's department of the Department of the East, having sent out a letter asking truck owners to cite the rate of rental per ton capacity of their vehicles.

A Practical Test

An example of the value of co-operation between the Motor Truck Club and military authorities was furnished on Sunday when the club furnished, at short notice, sixteen trucks ranging in capacity from 3 to 6½ tons to transport the ammunition, tents, camp supplies, food, clothing, guns and other paraphernalia of a New York regiment, which was ordered to report "somewhere in New York" at once. Early Sunday morning these trucks started fully loaded on a 65-mile trip and all reached their destination without trouble by 8 p. m.

2500 New Members for S. A. E.

Campaign for 1000 During April Grows—Each Member To Get Another

DETROIT, April 4—The Society of Automobile Engineers has started out to add 1000 new members during the present month. Instead of 1000 new members, it is really hoped 2500 new members will be added; in other words that each existing member will get one new member which will double the membership.

This increase or doubling of membership is necessary for military reasons. No class of men will be in greater demand than the automotive engineer in war. The war will be one of transportation, whether with the automobile, the motor truck, the airplane, the motor boat, or the farm tractor.

The task of adding 2500 new members falls on R. O. Gill, who is chairman of the S. A. E. membership committee, and incidentally for the month of April production manager of the Saxon Motor Car Co. Chairman Gill, and his committee, have divided the entire country into fourteen zones and have appointed a chairman for each. In every city where there is an S. A. E. member, a sub-chairman has been named to direct the active work in that city. Over 200 applications for membership have been received in New York.

Securing a new member to the S. A. E. at this time becomes a national obligation on every present member. Because of this close association of the society with the government the more men with engineering qualifications are placed in positions of importance the better for the country. In the early days of the war France and England made the error of letting their engineers be pressed into service in the trenches. The capacity of their factories dropped as low as 42 per cent. These countries immediately saw that engineers were needed in the factories and they immediately brought them back, those who were remaining, from the trenches. They realized their error.

The S. A. E. in its present membership campaign aims to avoid this error.

The present S. A. E. campaign instead of being one of mere membership becomes one of greater practical preparedness. It becomes one of conservation of our most coveted resources. Each member of the S. A. E. to-day should feel it a national duty on him to get that new member that he is expected to get. If you have not a membership blank, write to the headquarters for one. Don't wait until April 15. Don't count on getting your member the last week of the month. Do your country an active, practical service by getting your member next week. You may then be ready to get a second member the following week. If you are a good salesman you will try to have each of these members get a new one each before the month is up.

Detroit Factories Are Ready

Armed Guards Protect Buildings—Manufacture Munitions —Makers Offer Plants

DETROIT, April 4.—The automobile, motor truck and accessory industries in this city are ready for the closest co-operation with the national government. Beginning some days ago, many of the automobile and parts makers started the manufacture of munitions in accordance with previous agreements with the government, made in some cases months ago.

Secrecy in Some Plants

Factories which heretofore gave evidences of only great forges for industrial pursuits, have taken on a different atmosphere, and maintained armed guards around the buildings. In many it was impossible to discover what work the factories are engaged upon, but they have already turned their wheels of production in harmony with governmental demands.

One of the large parts companies is engaged now in the manufacture of shell, at least three of the motor car factories are making munitions in a small way to keep their men informed and machinery in readiness, one large manufacturer has practically perfected an aeroplane motor which, as soon as experiments are completed, will be made in great quantities, and a number of other plants are engaged in similar work. The stranger at the different factories finds himself carefully watched, and must have passes from the important officials of the concerns before he is allowed to venture beyond the front door.

Cadillac Files Report

The Cadillac Motor Car Co. has filed a report with the Government, setting forth the various means in which it could be of advantage. The factory is prepared to turn out special automobiles for transportation of troops, or to turn to the manufacture of army trucks, or to manufacture aeroplane motors, and stands ready to convert its automobile body plant into a factory for making aeroplane bodies.

Reo Can Serve

The Reo Motor Car Co., while not yet engaged in active government work, stands in readiness to do anything asked of it, and will divert its truck and pleasure car plants to government work on momentary notice. At present the company, as is the case with many others, finds it difficult to manufacture trucks and cars in quantities to meet the ordinary demand, and in consequence has none on hand that would be immediately available for government service.

The various divisions of the General Motors Co. are momentarily awaiting word from W. C. Durant, president, who is hastening East from the Pacific coast, and will, it is believed, send such men into government service as the country will require, besides turning over all machinery and factories as may assist in military operations.

The Maxwell Motor Car Co. has about 1000 trucks in process of manufacture that can be turned over to the government if they are wanted, and stands ready to either turn over its plant or divert operations as the demands may be.

The Willys-Overland Co. and the Ford Motor Co. have already expressed willingness to turn over their plants to the government, or to operate in any way the nation demands.

There will unquestionably be a general shaking up of manufacturing activities, and unquestionably certain companies will have to discontinue certain lines of manufacture and devote their attention to other lines required by the government. Among these might be mentioned the manufacture of munitions, aeroplane motors, and war trucks.

While there must of necessity be a certain secrecy maintained about the various activities, and the companies themselves refuse to divulge their operations or plans, it may be said that the machinery of every plant has been listed and indexed so that the government knows just what demands it can safely make.

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Connecticut Takes Census of Motor Vehicles

Offers of Service Divided Into Six Classes—Ford Owners of Country Mobilize

HARTFORD, CONN., April 2—The census of motor cars and motor trucks in the state of Connecticut, which is being taken for preparedness purposes, has been actively carried out and is a good example for other states. Each owner of a motor car or motor truck in the state has received a questionnaire asking for the capacity of the vehicle or truck as well as many other points of information, together with the telephone number of the owner.

The offers of service of automobiles or trucks have been divided into six classes as follows:

Class A. Motor trucks to be ready at 2 hr. notice for 3 working days.
Class B. Motor trucks to be ready at 48 hr. notice for 30 working days.
Class C. Touring cars or runabouts to be ready at 2 hr. notice for 3 working days.
Class D. Touring cars or runabouts to be ready at 48 hr. notice for 30 working days.
Class E. Motorcycles to be ready at 2 hr. notice for 3 working days.
Class F. Motorcycles to be ready at 48 hr. notice for 30 working days.

Plans for mobilizing all Ford car owners who will volunteer their services as a national Ford machine gun corps have been completed by the National Ford Owners' Club, 1777 Broadway, New York, and registration of volunteers is under way. General Wood and Secretary of War Baker have approved the plan, declaring that a corps of Ford cars equipped with machine guns and supervised by army officers would prove invaluable for Coast defense and other army work.

U. S. Calls on Truck Builders

Asks Them to Be Ready—Can Produce 200 to 300 Trucks a Day for War Use

DETROIT, April 4—*Special Telegram*—The government has notified larger truck manufacturers to hold themselves in readiness for war operations. At present there are about 1000 trucks in the different Michigan factories which will be immediately available and the combined production of all companies in truck business would produce between 200 and 300 trucks daily from Michigan factories.

Production Schedules

General Motors has 260 trucks on hand held up by the freight situation and is producing twenty daily. Republic is turning out seventy-five trucks daily and working 20-hr. shifts. It has 300 trucks stored in Detroit and 2000 stored among dealers. The Commerce company is making fifteen trucks daily with none on hand. It has large stock materials. It belongs to the National Security League and is ready to turn the entire plant and material over at once to the government.

Packard is making twenty-five trucks daily. Has none on hand unsold but would turn over several hundred awaiting shipment if needed. Signal has thirty trucks on hand and is making four trucks daily. The Acason Truck Co., is making three trucks per day. Federal Truck is producing fifteen vehicles per day and is engaged in work of a secret nature now. Denby is making twenty trucks daily and has 100 on hand. The company has organized employes for daily drills as a company to look after defence of industrial plants.

Packard is doing work of secret nature now. The company will soon concentrate on aeroplane motors following tests next week.

There is ominous silence among automobile makers. None will talk or deny that his factory could or would make war supplies or care to tell what activities they are now engaged in.

Lansing Plants Stocked Up

Lansing plants are under guards and have stocked up with materials and parts in readiness for the government's call.

All manufacturers have made statements to government telling what they can do, and lists of the trained drivers in the different factories are already in the War Department's hands. The Michigan State Auto School has turned its list of 4000 graduates with their present addresses over to the government and these will serve as drivers.

Cars have been donated by Chalmers, Dodge, Packard, Studebaker, Hupp and Maxwell for recruiting purposes and recruiting is being done at automobile factories under the auspices of the Women's Volunteer Committee.

Middle West Plants Pledged

Moline a Leader—Many Factories Offered to Government —Buildings Are Guarded

CHICAGO, April 4—*Special Telegram*—Automobile factories in the Middle West have already pledged themselves to the support of the government in the present crisis. A leader in this movement is the Moline Automobile Co., which has had a good schooling in the manufacture of munitions during the last year. President W. H. VanDervoort was recently appointed a member of a special committee on standardizing munitions for the government. He is also a member of the preparedness committee of the Society of Automobile Engineers. His factory has been manufacturing 8-in. shells for European belligerents at the rate of 300 per day for months, and with the expiration of this shell contract the plant was placed at the immediate disposal of the United States Government. In accordance with the recent government orders the buildings are at present under strong guard.

Chicago Stands Prepared

Automobile and parts producing factories in the territory around Chicago are alive to the value of their services to the government in case of war to such an extent that most of them have offered all or part of their equipment to the government at any moment that they are called upon.

One of the biggest passenger car and truck producers has gone on record to the government, offering its output and outlining its capacity. Dealers and customers have been notified that a government call would receive preference and that outstanding orders would be canceled to the extent necessary. Some factories are encouraging the enlistment of their men, and practically all of them give the assurance that these men will receive every consideration in the way of employment on their return from the front.

The Buda Engine Co., Harvey, Ill., has offered its entire output. It has notified all customers that if the government needs its product it will give preference to the government orders. Since much of the Buda firm's product is going into vehicles which will be of use to the government, it considers that the present disposition of its product is of immediate service value.

The same view is held by the Waukesha Motor Co., Waukesha, Wis. Waukesha engines are going into farm tractors in great numbers, and assuming that horses are going to be called upon for cavalry service in the proportion that they have been used in Europe, there will necessarily be an increased need for mechanical implements for tilling the soil.

It is the opinion of the officials of the zinc manufacturing concerns that this indirect assistance will be of the greatest value, although both are ready to direct their output wherever the government advises.

The Chicago Pneumatic Tool Co. can furnish 1½ and 2-ton trucks to the government on short notice. This company has been in the munition business for over a year. Several factories that desire to have their names withheld are situated among strong German element. In these stringent measures are being taken to guard against tampering. One of the larger factories has installed a lighting system on the outside of its factory, strengthened its force of watchmen and organized a detective bureau from its employees.

Wisconsin Makers Busy

The Four-Wheel-Drive Co. is now building thirty-seven trucks per week for the government and is arranging for increased output to meet probable increased government demand. The concern has promised the government to produce 200 trucks per month if called upon. The Wisconsin Motor Mfg. Co. is now furnishing many motors for trucks to truck builders who are working on government orders. Aviation engines are now being turned out, and the production can be increased to one a day on demand. It is understood unofficially that the Standard Oil Co. of Indiana and other refiners are accumulating stocks of fuel at the government's suggestion.

HOWARD E. COFFIN

Mr. Coffin is the logical man for the portfolio of Secretary of Munitions in President Wilson's war cabinet when that post is created

King Armored Car for Maryland

BALTIMORE, MD., April 3—The King Motor Sales Co., Inc., of this city has headed a public subscription list to purchase a light armored automobile for presentation to the Maryland militia. The car to be presented is manufactured by the King Motor Car Co., and the Armored Motor Car Co. of the same city. The latter concern recently filled an order for five of these light armored cars for the United States Navy.

Coffin for Munitions Secretary

Will Undoubtedly Be Appointed When Portfolio Is Created—Industrial Index Invaluable

WASHINGTON, D. C., April 4—Howard E. Coffin, according to general rumors around the capital, will undoubtedly be appointed to the position of Secretary of Munitions in President Wilson's war cabinet, when such a portfolio is created. Howard, as the industry knows him, has done more than any other man in the automobile industry in the work of preparedness, and it is questionable if any other man in the country has accomplished more of real value than he has. For practically a year now, he has devoted himself to the work of the Council of National Defense. In addition to devoting himself practically exclusively to this work, he has done so without remuneration, and has expended large personal sums in the work.

During the greater part of last year he maintained offices in New York, where he directed the work of compiling an industrial index of 30,000 manufacturers in every State in the Union. A sixteen-page questionnaire was sent out to these 30,000 manufacturers. Replies have been received from more than 27,000, and all of the information has been segregated and deposited in a card index which is instantly available. This card index gives the complete machine equipment of all factories of any and all kinds. It also gives much other valuable information.

By means of this information it is possible to find out in a few minutes how much ammunition of a certain size could be made in all of the factories in Connecticut, in Illinois, in Michigan, and in any other State in the Union. This one example but suggests the vast and useful scope of the work.

Howard Coffin has further kept very closely in touch with the manufacture and distribution of munitions in Europe, and is adequately qualified to assume such a portfolio.

Joy Aviation Field Offered to U. S.

DETROIT, April 3—Joy field, owned by Henry B. Joy, has been offered through Sidney D. Waldon, president of the Packard company, to the U. S. Government for aviation training. This field was inspected in 1915 by U. S. aviation officers and a favorable report was made. The Packard company has been testing its aircraft motors out on this field, which is near Mount Clemens.

Fifty aviators each 9 months could be trained there. A number of the automobile racing drivers who have enlisted in the aviation corps as a squadron are seeking to train on it. At the present time the equipment of the field is being considered by Mr. Joy, Gregory Flynn, representative of the drivers, J. D. Vincent, Packard vice-president, and W. B. Stout, Packard aircraft engineer.

Rubber Assn. Work Advanced

Preparedness Activities Under Way for a Year—Assn. Is Vitally Interested

NEW YORK, April 4—The Rubber Assn. of America is very directly interested in securing adequate naval and military protection for the country, as its members are entirely dependent upon open sea routes to the Far East and South America for their supply of rubber, without which they could not carry on their business. The organization has been active in disseminating preparedness propaganda, distributing literature and in general calling the attention of the public to the unprepared state of the country to resist military or naval aggression by foreign powers. Members of the club are co-operating with the government in the present crisis, but the methods and other details are kept secret for strategic reasons.

Business Papers Pledge Loyal Support to President

NEW YORK, April 3—Publishers of business papers in New York to the extent of upward of 100 went on record yesterday as pledging their loyal support to the President in the present crisis. The action was taken at the regular meeting of the Editorial Conference of the New York Business Publishers' Association, Inc. This conference is an organization of the editors of business papers. At yesterday's meeting, Chairman David Beecroft, directing editor of THE AUTOMOBILE, called for a resolution, and the following was passed and transmitted by telegram to the President:

Hon. Woodrow Wilson, President,
White House,
Washington, D. C.

Have honor to transmit following resolutions passed this noon by editors of trade and technical press of New York assembled:

Resolved, That the editors of the New York Business Publishers' Association, Inc., representing class journals of America, at this time of national crisis, are glad to pledge to the President of the United States their loyal support in his action for national defense. They will exert the influence of their trade journals in every possible way to promote unity of patriotic sentiment in the nation and effective action by every possible agency to aid the government's military and naval forces.

New York Business Publishers' Assn., Inc.,
F. M. Feiker, Secretary.

Simplex and G. V. for Aero Engines—Magnetos Available

NEW YORK, April 4—Among well known plants likely to be called upon for aviation engine manufacture are Simplex, now a part of the Wright-Martin company and the General Vehicle Co. The former is now in full production with the Hispano-Suiza engine for the Allies while the latter is just completing a British order for Gnome engines and is now making them on a United States order. The capacity of the two plants is fairly large, and being already in production there would be no delay whatever in greatly increasing the outputs. The General Vehicle Co. is also tooled up for the production of 3-in. shells and is practically through with its foreign order.

One thing for which the American government will not be in difficulties in the same way as the Allies were is in the matter of magnetos. Splitdorf, Bosch, and other firms are well able to take care of the aviation need, in fact their capacity is so great that the maximum demands that could be made by the air service would hardly be felt. Makers of such specialties as ignition devices, ball or roller bearings, carbureters, etc., are unlikely to be affected very much.

Peerless Adds Three Directors

NEW YORK, April 5—The Peerless Motor Car Co. at its directors' meeting this week elected F. L. Dane, William E. Griswold, and R. H. Rice to its directorate, replacing H. L. Hooke, P. D. Sawyer, and P. J. McIntosh. The other directors re-elected are: W. M. Coleman, T. W. Frech, F. Gilbart, E. W. Harden, L. H. Kittredge, C. Z. Rich, F. S. Terry, B. G. Cremaine, P. D. Wagoner and Harrison Williams.

J. M. Studebaker, Jr., Elected Director

NEW YORK, April 3—At the annual directors' meeting of the Studebaker Corp. here to-day, J. M. Studebaker, Jr., was elected a director, to succeed his father, J. M. Studebaker, Sr., deceased.

The board organized for the coming year with the same officers. The office of honorary president, which had been held by J. M. Studebaker, Sr., was left unfilled. The finance committee is composed of Messrs. Fish, Erskine, Hanch, Heaslet, and G. M. Studebaker. The executive committee is composed of Messrs. Fish, Delafield, Erskine, Goldman, Lehman, and G. M. Studebaker.

Crisis Finds Industry Prepared

(*Continued from page* 665.)

ing the activities of private individuals and factories and offering the resultant units to the government.

The Contest Board of the American Automobile Association started its co-operative work with the government in February, when it sent out its questionnaire to all registered racing drivers and mechanics asking for their willingness to serve as drivers of cars or to join the aviation department. Of the 350 replies received to date all expressed their willingness to serve.

No steps as yet relating directly to preparations in government co-operation have been taken by the American Automobile Association, but a number of state associations affiliated with the A. A. A. have offered the services of members' cars to the state authorities in their respective states. Some of these include New York, New Jersey, Maine and Washington.

The state of Connecticut has been particularly active in obtaining a census of all motor vehicles which might be used by the Federal or state authorities.

Doble Car Maker in Merger

General Engineering and Michigan Stamping to Combine into $10,000,000 Firm

DETROIT, April 4—The proposed merger of the Michigan Stamping Co. and the General Engineering Co. as a $10,000,000 corporation is expected at a meeting next Friday. The consolidation will give the General Engineering Co. facilities of the Michigan Stamping Co.'s 4 acre plant for the manufacture of the Doble steamer.

Two plans are under consideration; one is to give the stockholders of the Michigan Stamping Co. two shares of the new $10,000,000 stock and $5 cash for each share of the Michigan Stamping Co. held. The General Engineering stockholders would receive five shares for each share of old Engineering stock. The other plan provides for one share of new and $10 cash for the Stamping company stockholders.

The Michigan Stamping Co. now has $1,500,000 capital of which $200,000 is preferred. The General Engineering Co. has $200,000 capital, all common.

Church to Review Military Influence on Truck Design

CLEVELAND, April 11—On April 17 H. D. Church, chief engineer of the truck department of the Packard Motor Car Co., will present a paper to the Cleveland section of the S. A. E. concerning military influence on motor truck design. Mr. Church spent a considerable time with the Mexican expedition last fall, gaining first-hand information.

Continental Motors Dividend

NEW YORK, April 5—The Continental Motors Corp. has declared a dividend of 1¾ per cent on the preferred, payable April 16.

Gramm-Bernstein Reduces Capital

LIMA, OHIO, April 5—The Gramm-Bernstein Co. has reduced its capital from $4,000,000 to $1,500,000.

Government Will Buy Cars

NEW YORK, April 2—The U. S. Marine Corps has issued a call to automobile owners who wish to serve their country by enlisting in what it terms the Marine Corps Reserve B. Citizens who are capable of performing special useful service in the Marine Corps in the defense and maintenance of naval utilities, are eligible for membership in this class.

For instance, owners and operators of automobiles, motor trucks, motorcycles, aeroplanes, and other craft suitable for purposes in defense and maintenance of naval utilities, may be enrolled in this class and contracts made with such owners to take over their vehicles and crafts in time of war or national emergency upon payment of an indemnity.

S. A. E. Meeting June 26-29

Ottawa Beach Hotel on Lake Michigan Selected—Aeroplane and Boat Tests

NEW YORK, April 2—The Summer Meeting of the Society of Automobile Engineers will be held the last week in June at Ottawa Beach Hotel, on Lake Michigan. Ottawa Beach Hotel is located on the east short of Lake Michigan about 100 miles across the lake from Chicago. It is within 6 miles of Holland, Mich., and close to Grand Rapids.

From the time it was decided not to take a boat trip this year the 1917 Meetings Committee has been working steadily to arrange satisfactory hotel accommodations and has practically completed arrangements whereby upwards of 1000 members and their friends can be accommodated at Ottawa Beach Hotel and cottages. This hotel, one of the best known along the east shore of Lake Michigan, will be turned over exclusively to the engineers and their friends and many cottages around the hotel have been secured so that parties desiring to take a cottage and get their meals at the hotel may do so. Arrangements have also been made tentatively regarding Waukazoo Inn which is nearby and which can also be secured exclusively for the engineers if necessary.

It is fortunate that the last week in June has been secured as in previous years engineers have all objected to leaving about the middle of June. This year the dates will be Tuesday, Wednesday, Thursday and Friday, June 26, 27, 28 and 29. The last week in June will be much better suited for the meeting than earlier dates as it gives all engineers a better opportunity to finish their work before the session. July 1 marks the beginning of the holiday season and the last week in June has always been looked upon as a good week for the convention.

Activities Developed

The reason for changing from the annual boat trip to some exclusive hotel section is that the activities of the Society have developed very much during the last year by having aviation engineers, farm tractor engineers, and marine engineers amalgamate under the new title of Society of Automotive Engineers which change will be made April 19. With the Society membership embracing these three additional arms of the automotive industry it was necessary to secure larger accommodations than the boat afforded and also space where it would be possible to hold several sessions at the same time such as can only be done at a hotel given over exclusively to the engineers. Ottawa Beach will afford facilities for holding separate sessions when necessary for automobiles, trucks, aeroplanes, tractors and motor boats.

It was early discovered that the 1917 Summer Meeting should be held at some point along our Great Lakes where it would be possible to conduct hydroplane exhibitions if necessary and also where motor boat exhibitions could be given. Such a situation is afforded at Ottawa Beach where a narrow inlet connects the east short of Lake Michigan with Black Lake, an inland body of water 6 miles in diameter and ideally suited for hydroplane and motor boat activities.

It was also decided early that the farm tractor engineers should be given a good opportunity this year and that the S. A. E. would meet them more than half way by selecting Ottawa Beach. Ottawa Beach is centrally located for the entire automobile industry. Those desiring to drive by automobile can do so right to the hotel where good driving facilities are offered at low rates. The hotel is accessible direct by night or day boat lines from Chicago. It can be reached direct by train from Detroit, Indianapolis and other places. The Pére Marquette Railroad runs direct to Holland, Mich., which is only 6 miles from Ottawa Beach and from which point a trolley line connects with the hotel. The beach is also reached by Michigan Central by way of Grand Rapids.

4-Day Convention

The program for the 4-day convention is already well under way, having been laid before the S. A. E. Council at its meeting at Atlantic City some weeks ago. There will be 4 days given up to business sessions and recreation. It is hoped to devote the forenoons to business sessions and the afternoons to recreation. In connection with the hotel is an eighteen-hole golf course, several tennis courts, one of the best bathing beaches on the east shore of Lake Michigan, as well as good fishing in Black Lake and good motor boating. The location is one of the most attractive on the east shore of Lake Michigan and should prove an ideal place for the summer outing.

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Lozier Motor Co. To Reorganize and Add New Capital

NEW YORK, March 29—A complete reorganization is contemplated by the Lozier Motor Co., Detroit. It is planned to organize the company under Michigan laws, adding new capital and executives.

Plans are now under way for the establishment of dealers throughout the country, a change from the present factory branch arrangement. Several changes are contemplated in the construction of the car, for instance, the chassis is to be lowered 1½ in. and a few changes in the motor are contemplated.

The company plans entering the custom body field, having in view at present six or seven bodies for the single six chassis.

The recent purchase of the holdings of Samuel and Harry Frank by Theodore Friedeberg and his associates, it is stated, is a step towards the entrance of new blood into the organization. It is probable that the Lozier company will see a new managing board and the entrance of new outside interests from other companies.

Standard Parts Adds Western Spring

Four Companies Now Included in Unit—Parts Organization Program Completed

CLEVELAND, March 29—Definite announcement of the purchase of the Western Spring & Axle Co. by the Standard Parts Co. has been announced by President Christian Girl of that company, and Borton & Borton, the bankers sponsoring the financing of the Standard Parts concern.

Mr. Girl stated that the acquisition of Western completes the original program for the parts organization, and that the Standard Parts Co. will now be developed and rounded out on the basis of the companies now represented.

These include the Perfection Spring Co., the Standard Welding Co., the Bock Bearing Co., Toledo, and the Western Spring & Axle Co., with plants in Canton, Wheeling, Cincinnati and Carthage, Ohio, St. Louis, Connersville, Ind. and Flint and Pontiac, Mich.

The Standards Parts Co. as now constituted will use 175,000 tons of steel annually and will employ from 8000 to 9000 men. Its increased buying power, with a large volume of production and diversity of products including springs, axles, rims, tubing, bearings, heaters, etc. together with an advantageous distribution of plants is expected to permit of many economies.

The Western Spring & Axle Co. had a capital stock of $4,000,000 half common and half preferred. It is understood that it was taken in on a share for share exchange basis with Standard Parts, whose common stock was figured at a value of around $89 per share. As Western shareholders had an alternative of taking cash, the total amount of Standard Parts capital outstanding will not be definitely known until the exchange operation is completed, as the Standard company may decide to make payment from surplus cash on hand without a corresponding increase in its own capital.

President J. E. Hess of the Western company will become a member of the Standard Parts board, as will also W. E. Bock of the Bock Bearing Co. The board will be further enlarged by the addition of John A. Kling and Maynard H. Murch.

The Western Spring & Axle Co. was originally a Cincinnati concern. It has been manufacturing springs and axles for carriages for 50 years and more recently for automobiles.

New appointments made by Christian Girl, president, include R. Finkenstaedt, assistant to the president; J. Gutz, chief engineer; D. C. Swander, director of sales; H. H. Newhom, director of purchases; J. A. Barben, manager of publicity and J. A. Liston, manager of the jobbing department. An auditor will be appointed in the near future. Mr. Swander was formerly Firestone eastern sales manager. Mr. Liston, was formerly Thermoid western sales manager.

Tire Prices Again Higher

Advanced from 5 to 15 Per Cent--General Rise by All Companies Expected

NEW YORK, April 2—As predicted in these columns last week, tire prices have gone up, the increases ranging from 5 to 15 per cent. Last week it was stated that Kelly-Springfield would go up, but would withhold any announcement of its increase, pending action taken by the other companies.

To-day's increase includes nearly every large tire company. Kelly-Springfield has gone up about 6 per cent; Goodyear has risen 10 per cent on all sizes; Goodrich has gone up 10 per cent on its Silvertown straight side, its regular fabric tires, and on its tubes, and 15 per cent on its Q.D. and regular Silvertown cords; U. S. Rubber Nobby treads, up to and including 3½ in. sizes, are 10 per cent higher. Its round Usco and chain treads are also 10 per cent higher. All of the cord sizes are 10 per cent higher. Firestone tires are 10 to 12½ per cent higher, and Michelin tires are 10 per cent higher on the shoes and 5 higher on the tubes. Fisk prices are up 10 per cent on all sizes.

Ajax expects to go up 10 per cent. Though no action has been taken by the other companies in regard to changes in their lines, they are expected to go up, as there is a shortage in materials with higher prices. The increase in prices has been laid to lack of cargo space in ships from Europe and the embargo on Egyptian cotton by England. Fabric prices have been affected as a result, the tire makers paying as high as $1.25 a pound for it, as compared with 66 cents a year ago. Rubber prices are stationary. It is stated that if American ships could be sent to Alexandria, Egyptian cotton could be had far cheaper.

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Piggins Bros. Behind Racine Truck Co.

RACINE, WIS., March 31—It is reported that the Piggins Bros., which has been manufacturing motor trucks on a small scale for several years, is organizing the Racine Motor Truck Co., with a capital stock of $500,000, to build a large plant and engage in truck and tractor production on a large scale. Ira Miller, Los Angeles, Cal., is said to be associated in the enterprise. Further details will be announced as soon as the organization is completed, it is said.

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Spacke Machine Co. Sold

INDIANAPOLIS, April 3—The F. W. Spacke Machine Co. has been sold to a new corporation organized under the name of the Spacke Machine & Tool Co. The plant is valued at $500,000. The new company has assumed the operation of the plant, which is engaged in the manufacture of automobile parts.

The officers of the new company are: D. S. Brooks, president, formerly secretary of the Peru Auto Parts Mfg. Co.; J. R. Shortt, vice-president, formerly factory manager of the Peru company; and W. H. MacAfree, secretary and treasurer of the firm of McLaughlin, Young & Bowman, bankers, of Pittsburgh. The company is capitalized at $255,000.

Plans are being made to enlarge the business during the next year. The employees will be increased from 200 to 400. The company has a $1,000,000 contract on hand and expects to do not less than $1,500,000 worth of business during the next year.

The officers of the company which sold the factory were G. H. Spacke, president; Edward Spacke, vice-president, and D. S. Spacke, secretary and treasurer, all of Indianapolis.

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CAR PRICE CHANGES

Car—Model	Old Price	New Price
Dodge, Runabout	$785	$835
Dodge, Touring	785	835
Dodge, Detach. Top	950	1,000
Dodge, Sedan	1,185	1,265
Dodge, Coupe	1,185	1,265
Willys-Six, Touring	1,325	1,425
Willys-Knight 4, Touring	1,285	1,395
Marion-Handley, 6-40	1,275	1,350
Marion-Handley, 6-60	1,575	1,650
Maxwell, 2-Pas	620	650
Maxwell, 5-Pas	635	665
Lexington, Minute-Man 6	1,185	1,285

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Pyrene Fire Extinguisher $2 Higher

NEW YORK, April 3—The Pyrene Mfg. Co. will raise the price of its fire extinguisher on May 1 from $8 to $10.

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Fisher Offers Aeroplanes to U. S.

INDIANAPOLIS, IND., April 2—Carl G. Fisher, who last week made a formal offer to the army aviation department at Washington, D. C., of the use of the Indianapolis Motor Speedway as a training camp for aviators, has, in a telegram to the department, also offered aeroplanes to the department in addition and called attention to the fact that hundreds of automobile testers in Indianapolis would make the best possible material for aviators in time of war. The aviation department is anxious to accept the offer, but has postponed acceptance pending action by Congress on a bill to provide funds for the establishing of aviation training camps.

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New Jersey Firms May Hold Stock in Other Companies

TRENTON, N. J., March 30—Governor Edge has signed two Senate bills amending the Wilson "Seven Sisters" anti-trust laws of 1913, so that New Jersey corporations can acquire and hold stock in other corporations. The State anti-trust laws were made to conform to the Clayton Act.

The Governor also disapproved of a Senate bill to add a new section to the corporation laws authorizing shares of stock without the stated par value.

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Mahin Advertising Co. Changes Name

CHICAGO, April 2—The name of the Mahin Advertising Co. has been changed to Wm. M. Rankin Co.

Durant Buying Holt Tractor

Negotiations Under Way for Purchase of Caterpillar Tractor Business

NEW YORK, April 3—W. C. Durant is negotiating for the purchase of the Holt Caterpillar Tractor Co., according to information from the Pacific Coast where he has been visiting for the last several weeks. If this deal should be consummated it would assure a large scale production of caterpillar tractors which have proved so capable in the belligerent nations and also on the American farms. At the present time the Holt company is doing a large business with the belligerent nations having supplied them with almost 1200 of these tractors for use as tanks, etc. The sales of the company in 1915 amounted to $5,000,000 compared with $3,000,000 in 1914.

The Holt company has two plants, one in Peoria, Ill., and the other in Stockton, Cal.

The company was formed in 1892 as a partnership of Holt Brothers and the Stockton Wheel Co. In 1913 the company absorbed the Holt Caterpillar Co., Peoria, Ill., the Houser & Jaines Mfg. Co., and the Aurora Engine Co., Stockton, Cal., and the Best Mfg. Co., San Leandro, Cal. The company owns the Canadian Holt Co., Calgary, Alta., and manufactures also combined harvesters, plows, etc., under the trade mark, "Caterpillar." It is capitalized at $500,000 common and $1,000,000 preferred.

Mr. Durant is leaving Oakland tomorrow for New York. It is stated that he is considering establishing a Buick assembly plant in Oakland.

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Classification Ratings May Be Advanced

NEW YORK, April 3—The National Automobile Chamber of Commerce at today's monthly meeting reported further building on the part of the railroads of cars for shipping automobiles. About 200 cars have been added, but it is reported that these are not enough to fully relieve the present congestion.

The classification committee of the Eastern railroads has suggested that it would advance the classification ratings on a number of automobile parts, such as cylinders, castings, brass, bronze, aluminum and copper parts, wood wheels and fenders. This would mean that the present rate of so much per 100 lb. would remain intact, but that these parts would be included in a class higher up.

The Chamber to-day took up the question as to whether an automobile company may be held for suits in foreign states. The question came up as a result of a recent decision in Iowa wherein a prominent automobile company was served through a dealer in that State. The Chamber will go further into the matter through its attorney, Charles Thaddeus Terry.

N. A. C. C. Takes Technical School

Need for Automobile Draftsmen and Mechanics Leads To Enlargement

NEW YORK, April 3—To meet the need for more and better draftsmen in automobile body factories, the directors of the National Automobile Chamber of Commerce have voted to take the Technical School for Automobile Draftsmen and Mechanics in charge and to broaden its scope. This school, which has been conducted for 37 years in this city, is open to all employees of automobile or body manufacturing plants.

Charles Clifton, president of the Pierce-Arrow Motor Car Co.; H. H. Rice, treasurer of the General Motors Co., and Alfred Reeves, general manager of the N. A. C. C., have been added to the committee in charge of the school, of which Daniel T. Wilson is chairman. The committee plans to double the size of the school during the next year by accepting larger quarters offered by Mechanics Institute, which is now supplying quarters for the school without charge at 20 West Forty-fourth Street, and securing additional equipment.

Until 3 years ago the school was maintained by the carriage makers, who asked the automobile manufacturers to join in the support of this school at that time.

Graduates of the school are now connected with practically all the prominent automobile and body building plants in the country.

Day and evening classes are conducted without charge to the pupils, and there are more than 250 men taking the correspondence course, a charge of $24 being made for the full course of three terms, including 124 lessons. This course is in charge of Andrew F. Johnson, instructor of the school for more than 25 years. The scope of the correspondence department is to be broadened without raising the fees, which are $6 for the first term, $8 for the second and $10 for the third.

The pupils in the day and evening classes are divided into three classes; the introductory or free-hand class, the class for the study of descriptive geometry and the class for scale and full-size working drawings. The following gives a general outline of the studies:

1. Linear designing, including free-hand, scale and full-size drawing. 2. Geometry, applied to automobile body construction and known as the "French Rule" of drafting. 3. Complete automobile body drafting. Perspective and colored drawing of automobiles.

The correspondence class takes up the following:

First Term

First Series: Free-hand drawing. Eleven lessons.

Second Series: The use of mathematical instruments and curves. Lettering. Geometrical figures and their names. Geometrical problems. Method of sketching vehicles. Fourteen lessons.

Third Series: Geometry applied to automobile body construction; projection of points, lines and surfaces, laying out working draft of a phaeton body, and generation of surfaces illustrated on a phaeton.

Second Term

First Series: Movements of triangles and lines in space; rules applicable to plane faces illustrated on a trestle, a phaeton pillar, a cabriolet pillar and bottom frame of a landau, showing the method of finding the true size and shape of a pattern, and the bevel of shoulders of the cross bars. Thirteen lessons.

Second Series: In finding the dihedral angle, or in workshop parlance, finding the bevel of the leg of a trestle, phaeton pillar, cabriolet pillar, and landau parts. Six lessons.

Third Series: On the choice and disposition of joints. Three lessons.

Fourth Series: On the development of the outside surfaces of automobile bodies, including round corners with wheel house. Studies in shadows and the use of shade lines on drawings. Twelve lessons.

Third Term

First Series: Laying out square and round-cornered stick seats, and round-paneled seats; generation of double-curved surfaces, illustrated by a body with round bottom, including the study of different forms of bodies, such as drop-center landaus and broughams with ogee turn-under; ogee front-quarter, bottoms of bodies showing cheat line and proportional triangle illustrated on a body with a C-pillar back quarter. Twenty-four lessons.

Second Series: The draught of vehicles and division of weight, displacement of center of gravity, and objectionable modes of suspension. Four lessons.

Third Series: Locating the joints in top braces; developing outside surfaces having different side sweeps and turn-unders; developing mud guard surfaces by means of radial lines and by triangulation. Laying out round seats. Laying out cowls. Laying out roofs. Laying out turtle-back forms of bodies. Twenty-six lessons.

On the receipt of tuition fee, all lesson papers for the term are mailed to the pupil so he may see to what the lessons are tending.

Written examinations are required at the end of each series of lessons, to test the progress and proficiency of pupils, and at the close of the course diplomas are awarded to those deserving such recognition.

All employees of manufacturers of automobiles and automobile bodies, doing business within the United States and Canada, are eligible to membership in these classes of corresponding pupils.

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Jacobson Gets Saxon Contract

WARREN, PA., March 29—The Jacobson Machine Mfg. Co. has been awarded a $750,000 contract by the Saxon Motor Car Corp. for the manufacture of rear axles and transmissions. A brick addition will be built and the force increased from 300 to 400 men.

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J. L. Poole Dies

DETROIT, April 3—John L. Poole, export sales manager for the last 15 years for prominent automobile makers, died Sunday, in Chicago, of pneumonia.

Mr. Poole had been awaiting the completion of the European war to return to his old field work. When the war began he had just completed a contract with the Hupp Motor Car Corp. to represent that company in Europe under an arrangement which would have been very profitable to him.

White Earns 23.13% on Stock

Net Profits $3,701,041—Assets Total $11,674,875—Big Working Capital

CLEVELAND, March 31—The White Motor Co. earned 23.13 per cent on its capital stock in the past year. The first annual report of the White Motor Co. for the year ended Dec. 31, 1916, shows net profits amounting to $4,441,041, from which $740,000 has been set aside to reduce value of inventory to value based on prices current to Dec. 31, 1915. This leaves $3,701,041, equivalent to 23.13 per cent on $16,000,000 capital stock outstanding.

Current assets, as of Dec. 31, 1916, were $11,674,873, and current liabilities were $1,579,267, leaving a net working capital of $10,095,606.

Capital Assets Increase

Windsor T. White, in his remarks to the stockholders, pointed out that the capital assets of the company and its subsidiaries have been increased during the year to the extent of $616,262, the principal items being purchase of additional land for the factory, erection of a new factory building, affording approximately 111,000 sq. ft. additional manufacturing space, payments on the new sales building in New York, and the additions of machinery and equipment.

The income account for the year shows as follows:

Net earnings, after selling, manufacturing and other expenses	$4,087,027
Other income—discounts, dividends, etc.	354,014
Profit for year	$4,441,041
†Reserve	740,000
Balance	*$3,701,041
Dividends paid during year	1,160,000
Surplus	$2,541,041

*Equivalent to 23.13 per cent on $16,000,000 capital stock outstanding, or $11.56 a share on 320,000 shares of $50 par value.

†Reserve set aside to reduce value of inventory to value based on prices current Dec. 31, 1915.

The White Motor Co.'s combined balance sheet, as of Dec. 31, 1916, is as follows:

ASSETS	
Real estate, building, machinery, etc.	$4,016,491
Goodwill, patents, trade-marks, patterns, etc.	5,388,910
Inventories	6,835,176
Accounts receivable	1,809,621
Bills receivable	1,041,696
Cash on hand and in banks	1,988,379
Deferred charges to operations	126,507
Total	$21,206,780
LIABILITIES	
Capital stock outstanding — par value $50 a share	$16,000,000
Purchase money obligations	175,000
Accounts payable and payrolls	952,750
Deposits on cars	147,047
Accrued liabilities	479,469
Reserve for depreciation	171,472
*Other reserve	740,000
Surplus	2,541,041
Total	$21,206,780

*Reserve set aside to reduce value of inventory to value based on prices current on Dec. 31, 1915.

French Embargo on Cars

Decree Published March 22 Prohibits Importation of Foreign Goods

PARIS, FRANCE, March 24—France, one of our largest automobile and truck buyers, has prohibited the importation of goods of foreign origin either to that country or to Algeria. The decree was published March 22.

The prohibition is not applicable to imports for Government account, goods proved to have been shipped direct to France or Algeria before the publication of the decree, or goods declared for warehousing before its publication.

The gasoline situation in Europe is becoming more acute as each day goes by. To date, India, Holland and France have prohibited motor vehicle importation. Denmark's gasoline situation was so acute that it stopped the driving of passenger cars through its streets.

France was one of our biggest buyers in February, when she bought 503 cars valued at over $1,000,000. For the 7 months ending February, her purchases amounted to 4328 cars and trucks valued at $12,925,101.

Gasoline is now selling in France at 92 cents a gal. Each automobile owner is allotted a small amount per week. The official price fixed for the rarity is 74 cents the gal., sold by the 20-gal. lot and exclusive of the octroi or local tax entering into the city of Paris and the middleman's profit.

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Private Cars Hit by English Gasoline Shortage

LONDON, March 28—Lord Hylton announced in the House of Lords to-day that the supply of gasoline was so short that on the expiration of the current licenses in April none would be available for private automobiles.

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Mexico Enlarges Purchases of American Cars

WASHINGTON, D. C., March 29—Seven hundred and seventy-five automobiles have been imported into Mexico during the month of March as a result of the act of the de facto government removing import duties from all classes of motor vehicles. The law provides that each importation of this sort shall be accompanied by a consular invoice. In the middle of the month the Mexican consul at Nogales, Ariz., stated that 400 more automobiles would enter his country by the end of the month and there had already been 375 imported.

Sonora and Sinaloa are heavy users of motor vehicles. Sonora has a motorized mail service in districts where there is no railroad communication.

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U. S. Truck Gets Order from French Merchants

CINCINNATI, OHIO, April 2 — The United States Motor Truck Co. has received a running order for twenty 5-ton trucks a month, delivery commencing at once, the trucks to be used in France by Parisian merchants whose vehicles have been commandeered by the French government for war purposes. The order came through the offices of J. P. Morgan & Co. and is not a war order.

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Automobile Engineers at Aero Club Banquet

NEW YORK, March 30—The annual banquet of the Aero Club of America held in this city to-night took on a much greater national aspect than former dinners because of the military situation and had a peculiar interest for automobile people due to the aviation engineers having joined with the Society of Automobile Engineers in the last few months. At to-night's banquet there was a very broad representation of automobile engineers led by George W. Dunham, president of the S. A. E., who occupied a seat at the speakers' table. Jesse G. Vincent, member of the S. A. E. Council, and designer of the Packard aviation engine, was present. The Knox company, which has been developing an aviation engine, was present with several representatives. There were many other representatives of the automobile industry, among which might be mentioned A. L. Riker, Locomobile; Coker F. Clarkson, general manager S. A. E.; E. D. Vail of Waltham, Mass. and others.

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Dodges Lose Senate Fight

LANSING, MICH., March 30 — The Senate has defeated State Senator James Murtha in his effort to inject into the Scott bill, amending the incorporation act, an amendment that would settle the questions at issue between the Ford Motor Co. and Dodge Brothers. It took the position that it did not wish to settle the controversy by legislative enactment.

Murtha had four amendments, the first to compel an annual distribution of one-third of the profits of the corporation before increase in capital could be accomplished. The second was to compel submission of expansion or increased investment when the surplus was above $25,000,000 for more than one year to the State Securities Commission on the objection of any stockholder to withholding of dividends or increased investment program. The third was to exempt the Ford-Dodge case from the operation of the statute, and the fourth was to reduce the limit of capitalization, increased by the committee to $75,000,000 to $50,000,000.

The Scott bill was passed without the amendments.

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Edsel Ford a Defendant

DETROIT, April 2—Edsel B. Ford, having succeeded Davis Gray as a director of the Ford Motor Co., will appear in his place as a defendant in the suit brought by Dodge Brothers to force a disbursement of profits. The substitution was made following a motion by Dodge attorneys.

Gear Makers Assn. Formed

To Advance the Gear Industry —F. W. Sinram Heads Organization

NEW YORK, March 29—An organization of gear manufacturers was formed at Lakewood, N. J., at a recent meeting. This organization will be known as the American Gear Manufacturers' Assn. Its purposes are to advance and improve the gear industry in a general way by the standardization of gear design, manufacture and application. F. W. Sinram, of the Van Dorn & Dutton Co., Cleveland, is president; H. E. Eberhardt, of the Newark Gear Cutting Machine Co., Newark, N. J., is vice-president; F. D. Hamlin, of the Earle Gear & Machine Co., Philadelphia, is secretary, and Frank Horsburgh, of Horsburgh & Scott, Cleveland, is engineer.

The executive committee is composed of the following: F. W. Sinram, Van Dorn & Dutton Co., Cleveland; H. E. Eberhardt; F. D. Hamlin; Biddle Arthur, Simonds Mfg. Co., Pittsburgh; G. L. Markland, Philadelphia Gear Works, Philadelphia, and Milton Rupert, R. D. Nuttall Co., Pittsburgh.

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Moskovics Urges More S. A. E. Members

INDIANAPOLIS, March 31—The Society of Automotive Engineers needs over 2000 more members to insure adequate support to the government in case of war, according to F. E. Moskovics, commercial manager of Nordyke & Marmon, who addressed the Indiana section of the society here last evening. There are 8000 men in the industry eligible as members, and at least 5000 of these should be enrolled, whereas there are now less than 3000 S. A. E. members. Mr. Moskovics urged each member to work to this end.

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Champion Ignition Announces Aviation Plug—Suitable for Racing Cars

FLINT, MICH., April 3—The Champion Ignition Co., maker of AC spark plugs, now has ready for the market what it terms an aviation plug, but which is suitable for use on both aviation and racing motors.

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Mayo Radiator Business Merged—Production to Be Increased

NEW HAVEN, CONN., April 2—The Mayo Radiator Co. has been taken over by interests allied with the Marlin Arms Co. which recently took over the Standard Roller Bearing Co. and the Rockwell-Drake Co. The Mayo business will be expanded with enlarged capital. Virginius J. Mayo, who founded the company in 1905, will continue to be connected with the company. It is proposed to increase the output from 400 radiators a day to 1600.

News of Men In the Industry

CLEVELAND, April 2—Darwin Hanauer, M.E., has become chief engineer of the Hal Motor Car Co. He will specialize in the designing of custom-built bodies. Mr. Hanauer formerly occupied a similar position with the Baker, R. & L. Co. and held the same position with the Daimler, Simplex and Palmer-Singer companies. Mr. Hanauer was one of the pioneer designers of modern types of roadster bodies, the disappearing top, and a few other innovations in body building.

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DETROIT, March 30—W. T. Hunt has resigned as laboratory engineer of the experimental department of the Packard Motor Car Co. to join the Duesenberg Motors Corp. Mr. Hunt will do special work for the Duesenberg company, and will eventually be stationed at the new plant now being erected at Edgewater, N. J.

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CHICAGO, March 30—J. L. Zadek, member of the Society of Automobille Engineers, has resigned his position as foreman of assembling and testing departments of the Temple Mfg. Co. He has opened a shop here, specializing in model work, experimental work, tools, dies and metal stampings, including deep drawing and embossing.

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DETROIT, April 2—Karl M. Wise has been added to the staff of the Detroit Testing Laboratory and will have charge of the automobile and metallurgical department. Mr. Wise was formerly assistant engineer with the Chalmers Motor Car Co.

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YORK, PA., March 30—E. T. Birdsall, mechanical engineer, has been appointed consulting engineer of the Pullman Motor Car Co. Geo. McCrickett, former chief draftsman of the Pennsy Motors Co. under Mr. Birdsall, has resigned to take a similar position with the Pullman company.

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BOUND BROOK, N. J., March 29—D. C. Jenkins has been promoted to assistant to the production manager of the Bound Brook Oil-Less Bearing Co. He was formerly chief inspector. E. L. Evans is appointed chief inspector.

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LOS ANGELES, CAL., March 30—Roy D. Heartz, former sales promotion manager of the Hupp Motor Car Co., has accepted the position of assistant sales and advertising manager of the Moreland Truck Co., of Los Angeles.

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AKRON, April 2—The Goodyear Tire & Rubber Co. has made a number of changes among its branch managers. E. B. Sigerson, for several years Buffalo manager, has been given special work at the Akron plant. C. M. Clopp, special motor truck tire representative in Syracuse, takes Sigerson's place in Buffalo. J. E. Taylor becomes manager of the Charlotte, N. C., branch. M. Orr, former manager at Charlotte, takes the place left vacant by Clopp in Syracuse. W. C. Blake, for 6 years manager at Syracuse, has been made manager of the New York branch. He succeeds P. W. Smith, resigned.

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DETROIT, April 2—B. W. Scott has been appointed purchasing agent for the Puritan Machine Co. Mr. Scott was at one time supervisor of service for the Studebaker Corp.

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ST. LOUIS, MO., March 29—J. J. Hartley has become works manager of the Dorris Motor Car Co.

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DENVER, COL., April 2—H. J. Hicks has been given full charge of the wholesale business of the National Motor Co., National and Elgin distributor for Colorado, Wyoming and New Mexico.

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PITTSBURGH, PA., March 31—W. H. Latshaw, general manager of the Pennsy Motor Co., has resigned. G. L. Sintz, assistant engineer of Pennsy Motor Co., has resigned to become purchasing agent for the Pullman Motor Co., York, Pa.

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DETROIT, April 2—G. Franklyn Burger has resigned his position as sales and advertising manager of the Vincent Clear-Room Steering Wheel Co. His future plans have not yet been announced.

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ROCKFORD, ILL., April 2—W. C. Davies has become secretary and comptroller of the Burd High Compression Ring Co. Up till the present he has been auditor at the Chicago branch of the Hudson Motor Car Co.

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DETROIT, April 2—George R. Cullen, formerly of the advertising department of the Hudson Motor Car Co., has joined the advertising force of the Chalmers Motor Car Co.

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NEW YORK, April 2—Harry Lauterbach and Geo. E. Faile have taken over the entire exportation and practically all of the eastern territory for the sale of Rogers Brothers all steel trailers, manufactured by Rogers Brothers Co., Albion, Pa., bridge construction engineers and manufacturers. The new company organized by Mr. Lauterbach is known as Rogers Brothers Co., Inc., and executive offices are at 50 East Forty-second Street.

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INDIANAPOLIS, April 2—E. T. Klee, manager of the service department of the Stutz Motor Car Co., has resigned to accept a similar position with the Premier Motor Corp. Mr. Klee has been associated with the Stutz company for about 4 years and is president of the Indiana Service Managers Assn.

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DETROIT, March 30—W. G. Welbon is in Detroit forming three companies to handle the Doble steam car, the Ohio Doble Steam Car Co. of Cincinnati, the Indiana Steam Car Co. at Indianapolis and the Kentucky Steam Car Co. at Louisville. In addition to these three States Welbon probably will also handle West Virginia.

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SEATTLE, WASH., April 2—W. E. Darden, manager of the Seattle branch of the Prest-O-Lite Co., has been appointed division manager in charge of Oregon, Washington, Idaho, Montana and Alaska. J. L. Merritt has been appointed manager of the local branch, succeeding Mr. Darden.

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CLEVELAND, April 2—A. C. Hyser, formerly manager of the Atlanta branch of the Willard Storage Battery Co., has been appointed general service manager for the Willard company, with headquarters at the home office in Cleveland.

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CINCINNATI, OHIO, March 31—F. A. Trinkle has been appointed field service manager for the United States Motor Truck Co.

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DENVER, COL., April 2—P. A. Ross has been made sales manager of the Rocky Mountain Motor Co., Moon, Locomobile and Little Giant distributor for Colorado, New Mexico and Wyoming.

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CANNELTON, IND., April 2—J. E. Brooks will have charge of sales for the Lehman Manufacturing Co., this city, manufacturer of Lamco speed bodies for Ford, Maxwell and Overland cars.

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KENOSHA, WIS., March 30—W. A. Summerville, western division sales manager for the Republic Motor Truck Co., of Alma, Mich., has resigned and becomes zone sales manager for the Winther Motor Truck Co., of this city. Mr. Summerville will be recalled as the advertising manager of the Rapid Motor Vehicle Co., Pontiac, Mich., in the early days of the industry.

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DECATUR, ILL., March 29—The Comet Automobile Co. has elected officers as follows: President, G. W. Jagers; vice-president, G. V. Beck; secretary, W. E. Lewis; treasurer, G. W. Jagers; assistant treasurer, F. C. Zumdall; assistant secretary, T. J. Cowgill; general sales manager, G. V. Beck. Mr. Zumdall, of late, has been located in Rockford, Ill. J. M. Callahan, the former vice-president, and W. D. McClain, the former secretary-treasurer, both of Chicago, have retired from the company. Work upon the plans for the factory buildings has commenced and material for the assembling of cars in the temporary plant is arriving.

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CLEVELAND, March 30—A reorganization of the officers of the Hydraulic Pressed Steel Co. has resulted in the election of J. H. Foster, former vice-president and general manager, president; W. Ellenberger, former president,

chairman of board of directors; H. H. McIntosh, Jr., former treasurer, vice-president; Ben Bole remained secretary; H. B. Bole, former factory manager, general manager; R. D. Mock, former assistant treasurer and assistant to the secretary, is now treasurer and assistant secretary to the president.

Mr. Foster has been the active individual of the concern, which accounts for his new position. It is believed that the 8 per cent dividend on the common stock is likely to be continued after payment of the 100 per cent stock dividend, which has already been declared.

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DETROIT, April 2—Maxton R. Davies, manager of the Detroit office of the Dunlap-Ward Advertising Co., has been elected vice-president and secretary of the company. He will continue in charge of the Detroit office.

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CHICAGO, April 3—J. E. Duffield has become treasurer and general manager of the Baily Non-Stall Differential Corp., succeeding W. H. Needham. Mr. Duffield was formerly in charge of the tire sales for Brunswick-Balke-Collender Co.

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DETROIT, April 3—Al Walden, who resigned from the Chalmers experimental department to become service manager for C. T. Silver in New York, has returned to the Chalmers company as an experimental engineer.

DENVER, COL., April 2—L. E. Towne, has been made sales manager of the Miller Rubber Co., of Nebraska, with headquarters in Omaha and Nebraska and western Iowa as territory.

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CHICAGO, March 29—E. B. Wilson, formerly of the Buick Motor Co. here, has been tranferred to Flint, Mich., as special factory representative.

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DETROIT, April 3—W. G. E. Birkett, former advertising manager of the Gray Motor Co., has been appointed advertising manager of the Standard-Detroit Tractor Co.

Factory Activities in Brief

CHICAGO, March 30—The Sterling Cord Tire Co. has purchased the plant of the American Case & Register Co., Salem, Ohio, and contemplates equipping it to manufacture automobile tires.

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NEW HAVEN, CONN., March 29—Frank H. Trego has purchased the factory buildings of the A. C. Gilbert Co. at Fox and Ferry Streets. The Trego Motors Corp. was formed last week, with a capital of $1,500,000, to build motors, aeroplanes and flying apparatus.

—

OWOSSO, MICH., March 31—The Biggam Trailer Corp. has purchased a factory building here and will manufacture automobile trailers.

—

MILWAUKEE, WIS., April 2—The Gas Tank Recharging Co., will build a new plant in Layton Park, in the southwestern part of the city. The building will be of fireproof construction, two stories and basement, 35 by 100 ft.

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EAU CLAIRE, WIS., April 2—The Boone Tire & Rubber Co., Sycamore, Ill., and Des Moines, Iowa, has completed arrangements with the Progressive League of Chippewa Falls, Wis., for the establishment of a third plant in that city. Business men of Chippewa Falls raised a guaranty fund of $28,000 within 10 days' time. A building will be erected at once and with equipment will represent an investment of approximately $50,000. The plant will probably be ready by June 15 or July 1.

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MILWAUKEE, WIS., April 2—The Aluminum Goods Mfg. Co., Manitowoc, Wis., with plants at Two Rivers, Wis., and Newark, N. J., has awarded contracts for the erection of a $350,000 plant in Newark, to be ready Nov. 1. The Manitowoc works now are being doubled in size. The new Newark plant will be six stories high, 75 by 380 ft., of reinforced concrete, brick and steel. More than 300 men are employed at Newark at this time, and the force will be increased to 500 when the improvement is completed. Later it is planned to enlarge the Two Rivers branch by a large shop structure.

DETROIT, April 2—The Parker Rust-Proof Co. of America will erect branches in principal cities of the country. Two factories will be erected in each of the following cities: New York City, Chicago, Brooklyn, N. Y., and Philadelphia, Pa. One plant will be built in each of these cities: Buffalo, N. Y.; Syracuse, N. Y.; Pittsburgh, Pa.; Altoona, Pa.; Boston, Mass.; Worcester, Mass.; Hartford, Conn.; Bridgeport, Conn; Providence, R. I.; Newark, N. J.; Baltimore, Md.; Milwaukee, Wis.; Indianapolis, Ind.; St. Louis, Mo.; Minneapolis, Minn.; St. Paul, Minn.; San Francisco, Cal.; Kansas City, Mo., and the following Ohio cities: Cleveland, Cincinnati, Columbus, Dayton, Toledo and Youngstown. The Cleveland plant has been in operation for some time.

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DETROIT, March 31—The annealing plant of the Buhl Stamping Co. was damaged to the extent of $10,000 last night by fire.

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FORD CITY, ONT., March 31—Within 10 days the Chalmers Motor Car Co. Canadian plant will again be in full operation following the fire which last night damaged it to the extent of $250,000.

The Canadian plant is constructed of steel and concrete and in itself was not materially damaged. All of the cars, excepting forty finished limousines, in the plant were rescued and greatest injury sustained was to the assembling machinery. The records and books of the company were saved and business is being transacted to-day although company officials state it will take about 10 days before full operations are resumed.

The Canadian Chalmers building fire in no way affects the plant of the Chalmers Motor Car Co. of Detroit.

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INDIANAPOLIS, IND., April 2—The metal department of the Central Mfg. Co., Connersville, Ind., makers of bodies, was destroyed by fire last week, causing a loss of $150,000. William B. Ansted, president, said the plant will be rebuilt at once.

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DETROIT, April 2—The Chevrolet Motor Co. has invaded the house organ field. Volume 1, No. 1, of the Chevrolet Review, has been issued. It is a 16-page magazine sized paper, intended largely for the owner.

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FLINT, MICH., April 2—The Champion Ignition Co. will add another story to one of its buildings, giving it an increased floor space of 10,000 sq. ft. This is the third addition in the last 18 months. The floor space has been increased from 27,000 to 80,000 sq. ft.

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ELKHART, IND., April 2—To temporarily accommodate a part of its factory work, the Crow-Elkhart Motor Car Co. has erected a circus tent, 65 ft. wide and 155 ft. long, in which to give the completed cars their final test and make them ready for shipment. The company expects to occupy the new administration building about April 10 and will then start work on another addition to the factory.

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MISHAWAKA, IND., April 2—The Gillette Motors Co., Mishawaka, is considering plans for an addition to its plant. The new building is to be of brick, 200 ft. by 50 ft. The company is now testing out its Wilmo motor.

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MILWAUKEE, WIS., March 30—The Evinrude Motor Co., which recently entered the tractor motor field, is planning an addition, to cost $25,000.

—

FLINT, April 2—The Champion Ignition Co. will add another story to its plant. This will increase the floor space 10,000 sq. ft. and is the third addition in 18 months.

—

INDIANAPOLIS, IND., April 2—The Hayes Wheel Co., Anderson, has just placed an order for $10,000 worth of machinery for its plant. The company expects to manufacture from 1200 to 1500 sets of Ford automobile wheels daily when the machinery is installed.

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DETROIT, March 31—With the arrival of five carloads of machinery this week at the plant of the Harroun Motors Corp. the installation at the plant was started. The company's equipment of tools is now virtually complete.

New Plant for Haynes

Will Have Floorspace of 12 to 15 Acres—Progressive Production Planned

INDIANAPOLIS, IND., April 2—Plans for a new plant for the Haynes Automobile Co., Kokomo, Ind., were announced following a meeting of the board of directors last week. The company will buy a tract of land of 60 acres as a site and buildings will be erected with a ground-floor space of from 12 to 15 acres. The breaking of ground for the new plant will be started April 15.

The company recently purchased 30 acres of ground adjoining its present plant, but it was found that the ground was too small for the company's needs and that the type of buildings that have been designed could not be built there. Discussing the company's plans, A. G. Seiberling, general manager, said:

"In laying out the ground plan for the new Haynes plant, every effort has been made to make it coincident with the principles of progressive production and progressive assembly. The factory will be housed in six major buildings and a few smaller structures. The mechanical building will include the machine shop in connection with which will be a rough stock room and a finished stock room; the unit assembly department for motors, clutches, transmissions, axles and miscellaneous parts; the unit test department for the above; the chassis assembly department in connection with which will be a stock room for parts purchased ready for assembly.

"A separate structure will house the forge department and the heat treating department and this building will be placed so as to be in proximity to the rough stock room of the mechanical building. The chassis adjustment department and the chassis painting department will occupy a long, narrow building, which will be so placed that a chassis coming from the assembly may enter it with the least possible travel. At the other end of the building will be the wheel painting department and tire and rim store room, and wheels, tires and rims will be added to the chassis as it emerges from the paint.

"The chassis will then emerge into a building which will include a section of the final assembly department, the body paint shop and the body trim shop. The other section of the final assembly department will occupy a part of the building in which the sheet metal parts of the car are produced. The power plant will be centrally located, making the distribution of heat and electricity over the whole plant most convenient. Railroad sidings will bring the stock to the departments where it is to be stored and the storage places in all cases will be near the department where it is to be used."

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CINCINNATI, OHIO, March 28—The Pfau Mfg. Co. will triple its output. Orders on hand cover a maximum production for several months in advance. The automobile equipment department is rushed with both finished metal and woodwork orders, and the company is about to break ground for a new building of equal size with the present building. Work will be started on it within the next 2 weeks. It will be of full brick construction over steel, and four stories high.

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CLEVELAND, April 3—The Standard Steering Wheel Co. proposes to establish in this vicinity a plant for the manufacture of steering wheels, wood rims, spiders, for automobiles, trucks, aeroplanes, etc. The company is capitalized at $150,000. Its capital stock will be kept at this amount until such time as its plant is completed and capacity established. The first unit of the plant is expected to be completed and in operation by July 1.

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ADRIAN, MICH., April 3—The F. D. Truck & Auto Co. has been formed here. It is the successor to the Forduplex Co. The Duplex Motor Co. of Lansing, Mich., objected to the use of the latter name although the Ford Motor Co. had given its permission. The company is looking for a factory site.

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CLEVELAND, April 3 — The Peerless Motor Car Co. has moved its passenger car department into the new group of factory buildings which it has erected and which afford approximately 500,000 sq. ft. of additional floorspace.

The new buildings are housing the departments which manufacture the Peerless eight cylinder, two-power-range motor, the body building department, and the painting and finishing departments.

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Weideley May Move to Cleveland

INDIANAPOLIS, IND., April 3 — The Weideley Motors Co., a company doing $6,000,000 worth of business yearly, is likely to move to Cleveland, because of its inability to secure proper financial assistance here.

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17,844 Overlands in March

TOLEDO, OHIO, April 3—The Willys-Overland Co., shipped 17,844 cars in March, compared with 19,780 in March, 1916, and 7005 in March, 1915.

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Chandler Ships 2822 Cars

CLEVELAND, March 29—The Chandler Motor Car Co. shipped 2822 cars from Jan. 1 to March 10. This compares with 1791 a year ago. Since the second week in January, following inventorying, Chandler's output has been steadily increasing, until a weekly aggregate of 600 may soon be expected.

That the business of the Chandler company in the first quarter of this year was 83 per cent larger than in the same period of last year, and that the net earnings in the 3 months were equal to between $9 and $10 per share on the outstanding stock is the statement of F. C. Chandler, president of the company, in a circular to the stockholders.

Higher Freight Rates

Would Mean Expenditure Millions of Dollars by Automobile Industry

NEW YORK, April 3—In case the 15 per cent increase in freight rates is granted to the railroads by the Interstate Commerce Commission, it will mean the expenditure of additional millions of dollars by the automobile industry, although much of the burden will ultimately be borne by the buyers of cars.

In the case of completed cars shipped by factories to dealers, the freight, as usual, will undoubtedly continue as additional to the retail price and will be paid entirely by the buyer.

One effect this may have on retail sales will be that it will add a slight difficulty in the case of cars which are projected upward into the next hundred. For instance, a car that now sells for $1,025 plus $70 freight, which makes the price $1,095, will, with the addition of 15 per cent to the freight, go up into the $1,100 class.

It is stated that shippers are not making a very hard fight against the increase in rates and that there is considerable sentiment in favor of giving roads added revenue.

While much of the parts and accessories is shipped by express, the increase in freights will have a more direct effect upon the jobber and the dealer because it has not been the custom in the accessories trade to add freight with the advertised retail price, this being absorbed by the manufacturer, jobber and dealer as part of the overhead.

In the appended table are given the old rates, proposed increases and the new rates on standard carload shipments of 10,000 lb. minimum from Detroit and other Central West cities to various shipping points. All the rates are for 36-ft. cars with the exception of those to coast points, which cover 36 to 40 ft. cars.

Distances	Old	Increase	New
Toledo and Detroit to New York	$67.70	$10.15	$77.85
Cleveland to New York	61.50	9.23	70.73
Lansing to New York.	82.40	12.36	94.76
Flint to New York...	79.80	11.97	91.77
Detroit to all coast points	310.00	46.50	356.50
Detroit to New Orleans	142.40	21.36	163.76
Indianapolis to New York	80.60	12.09	92.69
Detroit to Atlanta	151.40	22.71	174.11

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Will Build 500 Homes

AKRON, March 30—Jacob Pfeiffer, president of the Miller Rubber Co., will erect 500 houses in Akron to relieve the existing housing congestion.

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Adds to Oxy-Acetylen Appliances

NEW YORK, April 2—The Bradford-Ackerman Corp., recently formed, has obtained the sole selling rights for Astra high temperature gas apparatus and oxygen welding appliances, produced by Ashton Laird & Co. In addi-

tion, the company will market an extensive line of oxy-acetylene welding appliances and a line of oxy-aluminating acetylene.

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Inglis Adds New Product

MILWAUKEE, WIS., April 2—The Inglis Mfg. Co., formerly the Wallmann Pump & Tank Co., has brought out a new automatic measuring device and pump for gasoline. Raising a small lever admits compressed air from a small supply tank and pushes up a hoist, which discharges the fuel directly into the reservoir on the car or truck, and automatically measures quantities from 1 pint to 1 gal., or from 1 quart to 5 gal., as designated on a dial. The device is designed for merchants and garage-owners.

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American Smelting Busy

DETROIT, April 2—The American Smelting & Refining Co. is said to be earning at the rate of $40 annually on the stock against actual earnings of $30 in 1916. By July the company will have a capacity for producing 1,300,000,000 lb. of copper.

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Rainier Truck Represented Abroad

NEW YORK, April 2—The Rainier Motor Corp. has arranged for representation and handling of the Rainier ½-ton, worm-drive truck in Australia and New Zealand by Chipman, Ltd., of Sydney and Auckland; in Norway by Bergens Automobile Co., of Christiania; in Sweden by Bruno Kassman, of Stockholm; in Holland by Amerikaansch Technisch Bureau, of Amsterdam; and in France by Andre Weil & Co., of New York and Paris. Numerous agencies have also been established throughout the United States.

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Capitalists After New Tractor

DETROIT, April 2—It is reported that two groups of financiers are negotiating for the control of the Wolverine Car & Tractor Co., and that some deal will be negotiated in the near future which will witness the completion of the transfer of the control to one of these groups.

Sheet Steel Prices To Advance

Strong Demand Accounts for Advance—Affects Tinplate, Tubular Goods and Wire

DETROIT, April 2—It is expected that a strong demand for sheets, tinplate, tubular goods and wire will soon be expressed in further advance in prices. One manufacturer of wrought pipe has increased prices $10 per ton, and other mills are said to be contemplating a similar move. The same may be said of cast-iron pipe, which advanced $6 per ton since March 9 and $11 per ton in the last 3 months. It is probable that the next few days will witness still higher prices. Some of the smaller mills are charging advances of several dollars per ton on wire and sheets. While the larger interests are more conservative, it is thought to be only a question of a short time before they announce new schedules.

Railroads have placed few orders for equipment in the last 2 weeks, but buying of cars during the month has been 100 per cent heavier in March than in February. Domestic railroads are anxious to place more orders for rails for shipment before July, 1918, but the mills are turning the business down. Foreign rail inquiries amount to 500,000 tons, but aside from 100,000 tons wanted for shipment to France on which bids have already been submitted there is small prospect of orders.

Contracts for 40,000 tons of plates and shapes for boats to be built on the Atlantic coast and an equal tonnage for small boats to be built on the great lakes have been accepted. Inquiries for 60,000 tons of additional plates for the same yards were unsatisfied. Export inquiries continue heavy but receive small consideration.

Buying of fabricated structural steel for factory extensions continues heavy and the prevailing high prices have small effect in checking orders. The Crucible Steel Co. closed a contract for 8000 tons, the Pittsburgh Steel Co. for 2000 tons, a Canadian paper mill, 1500 tons, and a Cuban sugar mill, 1600 tons. The United States government has placed orders for 500 tons for Mare Island improvements and is taking bids for 3000 tons for a gun shop and 3400 tons for navy yard shops.

The steel companies have organized in an effort to meet war needs.

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Makers Buy Heavily of Iron

DETROIT, April 2—The iron trade is apparently anticipating government requirements and making preparations to meet the anticipated large demands. It is now extremely difficult to supply the needs of consumers who desire prompt shipment and the difficulty is becoming greater daily. The present demands are for both foundry and steel making grades of iron.

Buying for 1918 continues active. Large automobile manufacturers have recently made very heavy purchases for next year and the foundries have been protecting themselves for several weeks past by contracting for at least a part of their requirements during the first six months of next year.

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Dividends Declared

Company, Federal Rubber Co. Dividend, $1.75 Q. Stock, 1st and 2nd pfd. Payable, April 1 and March 25.

Company, Pfau Mfg. Co. Dividend, 1¾ XQ. Stock, pfd. Payable, April 1.

Kelly-Springfield Tire, $1 Q. Common. May 1.

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Parker Has Many Licensees

DETROIT, March 30—The Parker Rust Proof Co. now includes among its licensees the Packard Motor Car Co., Reo Motor Car Co., the Byrne-Kingston Co., the Carter Carburetor Co., the Marvel Carburetor Co., Chalmers Motor Car Co., Houk Mfg. Co., Sparks-Withington Co., Firestone Tire & Rubber Co., Harrison Radiator Co. and the Perfect Window Regulator Co.

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New Companies

RUTHERFORD, N. J., March 30—The Security Tube Co. has been organized, with $50,000 capital, to manufacture automobile accessories, by J. F. Lynch, Joseph Zimmerman and Eliot X. Norton, all of New York.

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RACINE, WIS., March 31—The American Pattern & Mfg. Co. has been organized at Racine, Wis., by Sinius Christensen and Hans Nelson to do a general wood and metal pattern making business for automobile and other machinery manufacturers of Racine and other parts of the State. A shop has been established at Eighteenth and Racine Streets.

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DOVER, DEL., March 30—The Fabri-Cord Tire Co. has been incorporated to manufacture rubber tires and rubber products; capital stock, $2,000,000. Incorporators, H. E. Latter, N. P. Coffin, C. M. Egner.

The Kardell Tractor and Truck Co. has been incorporated to manufacture trucks, tractors and plows with a capital of $1,000,000. Incorporators, H. W. Kar-

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.61	.61	.61	.61	.60	.60	— .01
Antimony, lb.	.35	.35	.34	.34	.35	.35	...
Bessemer Steel, ton	70.00	75.00	75.00	75.00	75.00	75.00	+5.00
Copper, Elec., lb.	.34½	.34¼	.34½	.34½	.34½	.34	— .00½
Copper, Lake, lb.	.34½	.34¼	.34½	.34½	.34½	.34	— .00½
Cottonseed Oil, bbl.	13.95	13.80	14.00	14.15	14.14	14.30	+ .35
Fish Oil, Menhaden, Brown, gal.	.74	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime, gal.	1.55	1.55	1.55	1.60	1.60	1.60	+ .05
Lead, 100 lb.	9.75	9.75	9.75	9.63	9.64½	9.50	— .25
Linseed Oil, gal.	1.00	1.00	1.00	1.04	1.04	1.04	...
Open-Hearth Steel, ton	70.00	75.00	75.00	75.00	75.00	75.00	+5.00
Petroleum, bbl., Kan., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.10	1.10	1.10	1.05	1.10	1.10	...
Rubber, Fine Up-River, Para, lb.	.76	.76	.76	.76	.76	.76	...
Rubber, Ceylon, First Latex, Crepe, lb.	.81½	.82	.82½	.82½	.82	.83	+ .01½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.50	+ .05
Tin, 100 lb.	56.00	55.50	56.00	54.50	54.50	54.50	—1.50
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

dell, J. C. Kardell and H. F. Fahrenkrog, all of St. Louis, Mo.

The Union Tire Co. to manufacture tires and automobile supplies; capital stock $500,000; incorporators, R. P. Sullivan, H. A. Gross, A. E. Kountz, all of Pittsburgh, Pa.

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NEW YORK, April 2—Glen Motor Truck & Trailer Co., automobiles, trucks, trailers and tractors, incorporated with a capital of $3,000,000. The incorporators are: A. W. Britton, H. B. Davis, S. B. Howard, New York.

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INDIANAPOLIS, IND., April 2—Incorporation papers were issued last week for the Gould Motor & Mfg. Co., Marion. The company, which is capitalized at $100,000, will manufacture automobiles and aeroplanes. Directors are S. O. Gould, F. M. Beshore and E. S. Payntor.

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PEORIA, ILL., March 30—The Kerosene Motor Co. has been formed, with a capital stock of $100,000, to manufacture kerosene transformers. Work has been started. George McFarland is president; E. M. Smith, vice-president; F. H. Bush, secretary-treasurer.

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TOLEDO, March 30—The Kuenz Radiator & Sheet Metal Co. has been incorporated, with a capital of $50,000, to manufacture automobile radiators. It is successor to the business of Joseph Kuenz.

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LANSING, MICH., March 31—The Brisk Blast Mfg. Co., Monroe, has been incorporated for $200,000.

The Auto Accessory Mfg. & Sales Co., Benton Harbor, has been incorporated for $5,000.

Automobile Stocks Inactive

Tire Issues Weak Also—Maxwell and Ajax Show Substantial Gains

NEW YORK, April 3—War developments in this country have caused a slackening up in the demand for automobile and accessory issues. In fact the whole market consisting of those issues not benefited by war, is lower. The only bright spots in the motor issues last week were gains of 5½ points on Ajax and 1½ to 3¾ points on the three Maxwell stocks. General Motors and Goodyear, which are quoted higher than a majority of the stocks, also chalked up substantial gains. General Motors common rose 2 points, while Goodyear common ascended 5½ points.

Tire issues as a whole were weak last week. Though these companies have raised their prices with prospects of larger earnings this year, the demand for their stocks has fallen. Portage Rubber, Kelly-Springfield, Lee, Goodrich, Firestone and Swinehart, all recorded declines. Portage featured this drop with a loss of 25 points on its common.

Automobile gains and losses were fractional, few big changes being recorded.

Last week $1,966,125 in the common stock of the Willys-Overland Co. was listed on the Stock Exchange, making the total amount to $41,621,825.

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G. M. Sales One-third Larger

NEW YORK, April 2—Sales and shipments of General Motors are running about 33⅓ per cent ahead of last year, or at a rate close to 175,000 cars for its fiscal year ending with July.

Production in the last 4 months has been running at the rate of 14,400 cars a month, as against 12,600 from August to October.

—

Capital Increases

BAY CITY, MICH., April 2—The Union Motor Truck Co. has increased its capital from $15,000 to $30,000.

—

GRAND RAPIDS, MICH., April 2—The Field Motor Co. has decreased its capital stock from $500,000 to $300,000.

—

ALMA, MICH., April 2—The Republic Motor Truck Co. has increased its capital from $1,312,500 to $1,500,000.

—

OSHAWA, ONT., March 29—The Chevrolet Motor Co. of Canada, Ltd., has increased its capital stock from $500,000 to $1,500,000.

—

SAGINAW, MICH., March 30—The Saginaw Motor Car Co. will increase its capital to $1,000,000 and elect new officers at its meeting to be held April 10.

—

SAGINAW, MICH., April 3—The Saginaw Motor Car Co. has increased its capital from $100,000 to $1,000,000, all of which, both old and new, will be in common stock.

The company has orders on hand for 800 cars. It now employs 65 men, but in the next 30 days expects to increase this number to 150 and in 1 year to 500.

—

Bowser Expects $2,000,000 Business in 1917

FORT WAYNE, IND., March 30—The S. F. Bowser Oil Tank & Pump Co. has in-

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	72	73	+5½
*J. I. Case T. M. Co. pfd.	80	88	—1
Chalmers Motor Co. com.	24	30	..
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	100	103	—1
Chevrolet Motor Co.	126	130	—1
Fisher Body Corp. com.	34	38	—1
Fisher Body Corp. pfd.	94	96	..
Fisk Rubber Co. com.	65	75	..
Fisk Rubber Co. 1st pfd.	101	105	..
Fisk Rubber Co. 2d pfd.	70	100	..
Firestone Tire & Rubber Co. com.	140	142	—1
Firestone Tire & Rubber Co. pfd.	107	109	..
*General Motors Co. com.	120	120½	+2
*General Motors Co. pfd.	90	90½	— ½
*B. F. Goodrich Co. com.	54⅛	55	—1¼
*B. F. Goodrich Co. pfd.	108½	112	— ¼
Goodyear Tire & Rubber Co. com.	244½	247	+5½
Goodyear Tire & Rubber Co. pfd.	106	107	..
Grant Motor Car Corp.	6	8	..
Hupp Motor Car Corp. com.	4	5	..
Hupp Motor Car Corp. pfd.	80	85	—5
International Motor Co. com.	..	16	..
International Motor Co. 1st pfd.	..	70	..
International Motor Co. 2d pfd.	..	30	..
*Kelly-Springfield Tire Co. com.	61	62	—2
*Kelly-Springfield Tire Co. 1st pfd.	90	93	—3
*Lee Rubber & Tire Corp.	21¼	22	—1⅛
*Maxwell Motor Co., Inc., com.	56	56½	+3⅛
*Maxwell Motor Co., Inc., 1st pfd.	69	71⅜	+2¾
*Maxwell Motor Co., Inc., 2d pfd.	34½	36½	+1½
Miller Rubber Co. com.	230	237	..
Miller Rubber Co. pfd.	104½	106¼	— ½
Packard Motor Car Co. com.	..	161	..
Packard Motor Car Co. pfd.	..	101	..
Paige-Detroit Motor Car Co.	36¾	37¾	+ ½
Peerless Truck & Motor Corp.	15	17	+1
Portage Rubber Co. com.	154	161	—25
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	..	23	..
Reo Motor Car Co.	34¾	35½	+ ¼
*Saxon Motor Car Corp.	55½	57½	—1¾
Springfield Body Corp. com.	70	80	..
Springfield Body Corp. pfd.	110	120	..
*Stewart-Warner Speed. Corp.	82½	83½	+1
*Studebaker Corp. com.	98¼	99	—3
*Studebaker Corp. pfd.	104	106	—1
Swinehart Tire & Rubber Co.	75	80	—3½
United Motors Corp.	38¼	38½	..
*U. S. Rubber Co. com.	58½	58¾	— ½
*U. S. Rubber Co. pfd.	108¼	109	+ ¼
*White Motor Co.	48⅜	50	— ⅝
*Willys-Overland Co. com.	33¾	34⅛	+ ½
*Willys-Overland Co. pfd.	96½	97½	— ½

*At close March 30, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	33	..
Chalmers Motor Co. com.	..	..	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Corp. com.	7½	7⅞	+ ⅛
Continental Motor Corp. pfd.	98	99	..
Ford Motor Co. of Canada	295	305	..
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	51½	54½	..
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	..	162	..
Packard Motor Car Co. pfd.	..	101	..
Paige-Detroit Motor Car Co.	37	..	+ ¾
W. K. Pruden Co.	..	30	..
Reo Motor Car Co.	35¼	35¾	+ ¾
Studebaker Corp. com.	101½	104½	—1
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	..	28	..

INACTIVE STOCKS

Atlas Drop Forge Co.	..	..	..
Kelsey Wheel Co.	..	..	..
Regal Motor Car Co.	..	26½	..

creased its capital stock to the amount of nearly $500,000 and has now reached its greatest expansion point since the firm was instituted, 31 years ago. The capital stock has been increased from $800,000 to $1,250,000. Officials declare the increase in capital stock is to provide for the needs of the rapidly growing company. The estimated business for the present year is $2,000,000, a 25 per cent increase over the sales receipts of 1916.

—

Savage Checks Ready

DETROIT, March 30—Final dividend checks in the case of the bankrupt Savage Motor Car Co. have been mailed from the office of the referee in bankruptcy. The final dividends amount to 2½ per cent, which is $1,300.

When the company went bankrupt in 1914 a 38 per cent arrangement was exacted with the creditors, who received about $35,000, with the proviso that any further effects should be paid them when realized. General claims against the company were $52,000 and preferred claims were $9,000.

—

150 C. A. S. Steering Gears Daily

COLUMBUS, OHIO, April 2—The C. A. S. Products Co., manufacturer of steering gears, is making progress under new management and the production is now more than 150 steering gears per day. The product has been standardized and several companies are taking all the company can make. The company employs more than 100 men.

—

Reo Pays Soldier Employees

LANSING, MICH., April 3—The Reo Motor Mfg. Co. gave forty-two employees, who served with the Lansing battery on the Mexican border, more than one-half their salary for the 8 months the soldiers were absent, on their return to work Wednesday. Some of the men averaged more than $400 in back pay.

—

Plans Racing for Twin Cities

NEW YORK, March 30—The revival of speedway racing at the Twin Cities track is being planned. A complete reorganization will soon occur and a race meet will be held some time this spring. Stanley Kandul, of Chicago, who has been identified with the automobile racing field, is working on the reorganization.

—

A. A. A. to Move New York Office

NEW YORK, April 2—The American Automobile Assn., which has been located at 437 Fifth Avenue, will move April 21 to 501 Fifth Avenue. This is a move of three blocks closer to the Grand Central depot. The new location is on the corner of Fifth Avenue and 42d Street, which is one of the best corners in the city. The headquarters of the Contest Board will also be located at this address, which is in the new building of the Astor Trust Building, not yet completed.

25 M. P. G. with Kerosene

Test of G. P. System by A. A. A. Shows Better Acceleration and Distance

CHICAGO, March 30—Statements of kerosene enthusiasts that economy of operation on kerosene as compared with gasoline comes not only from the difference in the price of the fuel itself, but also in a greater mileage per gallon on kerosene if carburetion and compression are properly cared for seems to be borne out by a recent A. A. A. test of the G. P. system for using kerosene in which a distance of 25.5 m.p.g. was run on a gallon of kerosene as against 23.0 m.p.g. of gasoline with a Ford car and stock carbureter.

This test was under sanction of the American Automobile Assn. and under the supervision of E. A. Hillman, representative of the A. A. A. contest board for this territory. With the same setting of the carbureter at which the economy test was made, an acceleration from 10 to 25 m.p.h. was made in 15.6 sec. With that adjustment the car idled down to 10 m.p.h., but with a richer adjustment its running was good at 4 m.p.h. The car has been in service since last Fall during which period the carbon had been removed twice, according to the owner. It had been operating on kerosene since it came from the factory. During the test the top was down and the windshield up, and with the three passengers, weighed 2156 lb.

The G. P. system made by the G. P. Coal Oil System Co., 1806 Michigan Avenue, consists of a patented means of heating the intake gas by passing it through a specially designed manifold heated by the exhaust gas. In starting a cold motor, gasoline is used, the change to kerosene being made by a valve on the dash as soon as the engine warms up.

—

Uniontown Speedway for War Training

UNIONTOWN, PA., March 29—The Uniontown Speedway Assn. has given over its track and grounds for mobilization work for automobile drivers and aviators. The camp will be opened within 2 weeks. Thompson, of Washington, Pa., an aviator, will instruct the aviator class, and W. H. Pickens will have charge of the automobile racing drivers. Races will be held to defray expenses.

—

Uniontown Speedway Program Announced

UNIONTOWN, PA., April 3—The program for the local speedway meet on May 10 has been announced by the Uniontown Speedway Co., which is arranging for three events which include one event for 300-in. cars. This will be 112½ miles with $10,000 in prizes and the Universal trophy. Another event will be for stripped stock chassis. This will be 54 miles long, the first at that distance since 1912. There are three silver cups up for this race. There will be another 112½-mile race. This will be an invitation affair for dealers and will be non-stock, free-for-all, only for dealers within 150 miles of this city. Prize money in this race amounts to $2,250. The dealers are allowed to enter two cars. So far the following dealers' entries have been promised: Mercer, Haynes, Pathfinder, Murray, Chandler, Peerless, Packard, Buick, Chalmers, Dort and Stearns.

Oldfield, Omar Toft and Louis Chevrolet have signified their intention of entering cars in the races. Oldfield, it is stated, will bring his new Miller Special.

—

A. A. A. Contest Booklet Out

NEW YORK, March 30—1916 Automobile Contests is the title of a booklet issued by the contest board of the American Automobile Assn. It gives the results of all automobile contests held in 1916 under the rules and with the sanction of the A. A. A., and is compiled from the official records in the office of the contest board by W. Harvey Traband, Jr., and T. B. Shoemaker.

The booklet gives the list of registered drivers, mechanicians, racing cars and stock cars for 1916, also the licensed tracks and speedways. A summary of the Glidden Tours is included. Among the useful tables given are: French and American equivalent measures, gradients, piston displacement and a reference table showing equivalent speed in miles and kilometers per hour over the measured mile or measured kilometer from 24 sec. progressively by 1/5 sec. to 59 4/5 sec.

Copies of the book may be secured for 50 cents each from the contest board of the A. A. A., 501 Fifth Avenue, New York.

—

5000 Haynes Average 15 M. P. G.

KOKOMO, IND., March 30—Effect of road conditions upon the cost of running a car was brought out very forcibly in the results of an investigation of the performance of 5000 Haynes sixes now in the service of owners. Fuel, oil and tire mileages were greater on the average in California than in any other part of the United States. In the Dakotas, Minnesota, and many of the southern States, a very much lower mileage was shown. The maintenance cost of cars used by farmers were 10 per cent less than the upkeep of those belonging to city residents.

An average of 15 miles to the gal. of gasoline and over 200 miles to a quart of oil is the finding of the inquiry. Investigation went into every State in the Union, as well as a number of foreign countries. While these figures on economy are exceptionally good, they are less striking than the data received on tire mileage. It was found that the 5000 cars were averaging 6280 miles to the set of tires. One Ohio Haynes owner stated that his car had gone more than 21,000 miles on its original tire equipment.

THE AUTOMOBILE

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Prepared

THE crisis in the history of the United States finds the automobile industry well prepared to do its share of the work ahead, and more than ready, in that it will shoulder much of the responsibility that other industries are not able to assume.

The automobile industry is the most highly organized of any; it is organized on a basis of rapid production and it can make changes in its product quicker than any other industry. Largely, thanks to the standardization work of the Society of Automotive Engineers, the engineering brains of the industry are bound together and can act together promptly. Similarly the many other strong associations bind together the personnel of the whole trade.

The automobile industry can handle any transportation problem the Government can proffer.

From the building of the vehicles to their maintenance in the field the automobile industry can keep ahead of all possible requirements.

Help for Aviation

Unfortunately other equally, if not more vital, industries are not so well prepared. In the air America is practically defenseless. Thousands of aeroplanes are needed, thousands of engines for the planes, thousands of aviators to fly them. There is only the nucleus of an aircraft industry, and since this cannot begin to cope with the situation help must come from somewhere, and it will be to the automobile organizations that we must turn. With their aid it will not take long to boost aeroplane production to automobile proportions.

In the marine field, too, we see need for many small, fast boats, and the demand for engines will surely overpower the marine motor plants. Here again our great automobile factories can lend a hand. The product is a type with which they are familiar, the parts not beyond the capacity of their machine equipment.

No industry has so much power to help and no industry is better able to get on its job with both rapidity and efficiency.

Suitable Work

THAT the automobile factories will be switched suddenly from their normal product to something as different as shell or guns is highly improbable. Creating an air fleet and helping to make the mosquito motor boat fleet in addition to handling all land transportation matters are the jobs that the automobile industry will have to carry.

Munitions Facilities Ample

We have ample facilities for munition production in large plants already tooled up and just finishing long months of production for the Allies. These plants can produce far more shells than there are guns to shoot them with; and there are few automobile plants who could give much help in gun making. If increasing output of guns and shell affects the automobile industry in any way, it will probably be by making it still harder to obtain material.

There is plenty of steel for munitions and guns, plenty for everything that army and navy can make use of. It is only in aircraft and in manpower that America faces to-day the situation faced by England in 1914.

We may see instances of automobile factories ordered to concentrate on production of one thing only, army trucks and aeroplane engines being the foremost possibilities. It would not be surprising to see several of the largest plants all turned upon making just one article, but it will be an article that they are suited to produce and its production will not disorganize.

Must Conserve Material

In general trade, outside of government orders, we may see outputs curtailed by government in order to conserve material. Certain classes of steel may become impossible to get; alloy steels, for example, will certainly be harder to obtain as aircraft production speeds up; but there is no reason to anticipate a great upheaval, an earthquake that will upset the whole fabric of the industry. Also the supply of steel is much greater than it was 2 years ago and the effect of United States war orders is more likely to be that of maintaining present conditions in material supply than that of making them still worse.

Goethals To Build Roads

Builder of Panama Canal Appointed Chief Engineer of New Jersey—To Reorganize Highway System—THE AUTOMOBILE Suggests Modern Motor Highway Linking New York and Philadelphia

TRENTON, N. J., April 2.—Scientific road building in the United States on a scale commensurate with the importance of the movement received a great impetus today when the State of New Jersey appointed Gen. George W. Goethals, builder of the Panama Canal, to the position of chief engineer of the State. General Goethals made a world reputation for himself when he literally took his engineering axe and cut a big ditch across the backbone of the Americas at Panama. He accomplished a job that the greatest engineers of Europe had failed to accomplish. In the building of the Panama Canal he accomplished one of the great engineering features not only of the century but of many centuries.

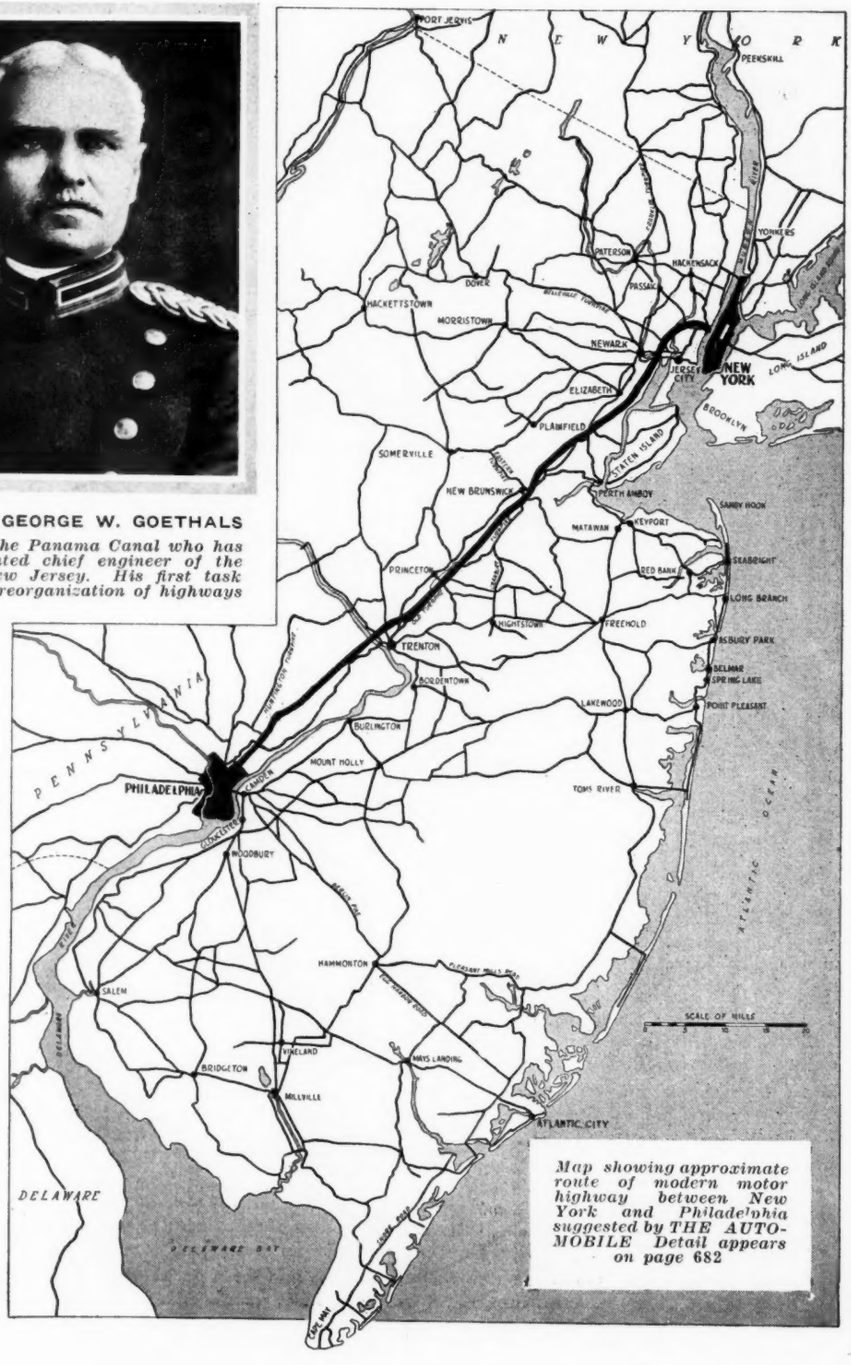
GENERAL GEORGE W. GOETHALS

Builder of the Panama Canal who has been appointed chief engineer of the State of New Jersey. His first task will be the reorganization of highways

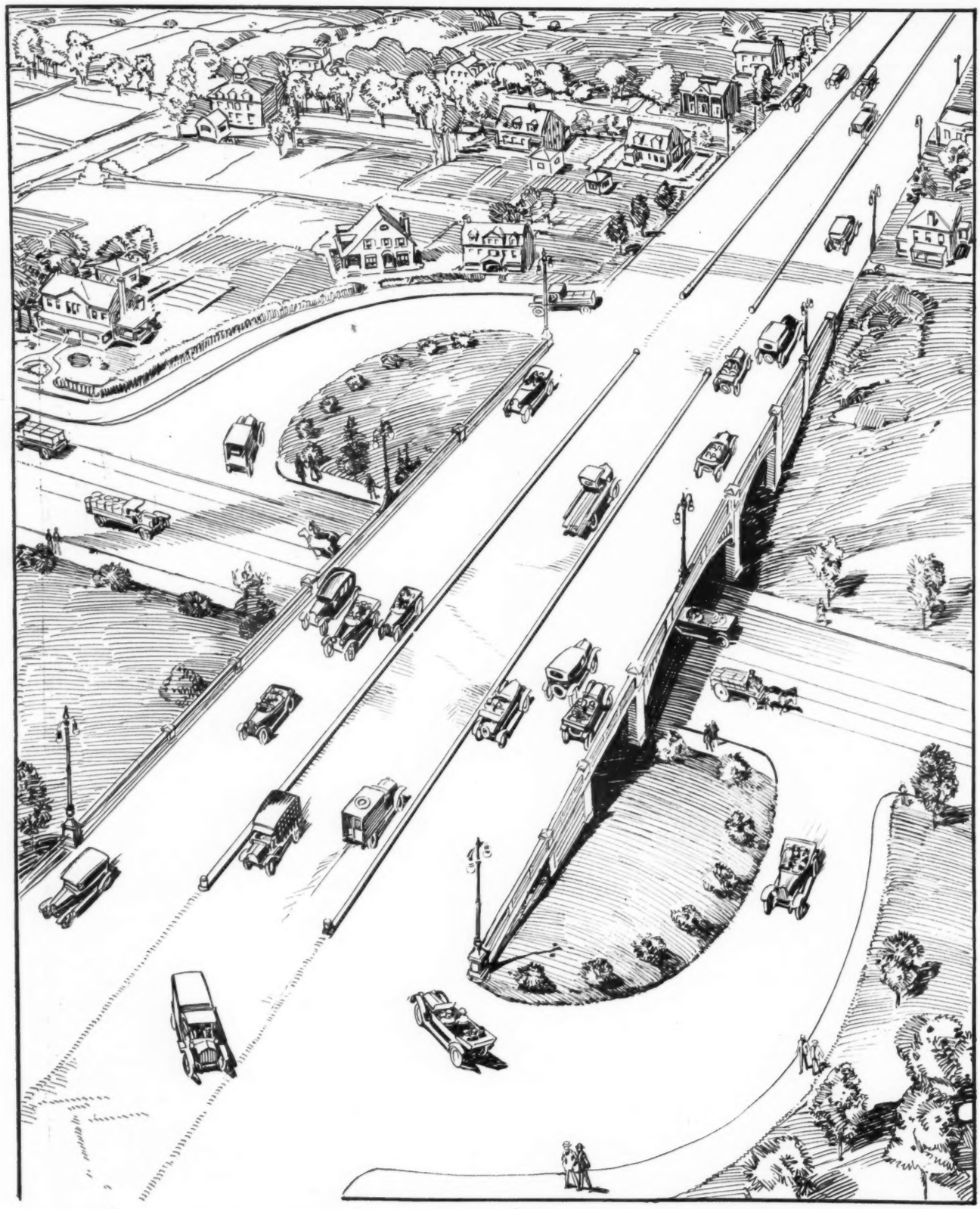
In his new post of engineer of the State of New Jersey it is expected that General Goethals will bring into road building some of the nation-creating ideas that lay back of the Panama Canal. In America as much has to be done in road building as has been done in canal building. The appointment of General Goethals augurs a new era in highway construction, and it is anticipated that plans for the modern highway, such as scarcely dreamed of by many, may become the backbone of New Jersey's road system.

As yet, General Goethals' appointment is but a few days old, yet plans for the future have been laid and an inspection of the highway system has already been started.

In appointing General Goethals to his new position Governor Edge



Map showing approximate route of modern motor highway between New York and Philadelphia suggested by THE AUTOMOBILE *Detail appears on page 682*



THE ideal motor highway will have three tracks, the center for trucks and the two outer for fast moving vehicles. There will be no grade crossings and all important cross streets will pass underneath, while the connections will be made by ramps so set that entering traffic comes on in the direction of travel. Such a road between say New York and Philadelphia would be a great asset to the nation and it is only a matter of time before some such highways, for motor vehicle use exclusively, connect all the great cities of the country.

of New Jersey has in mind developing all of the natural resources of the State as well as the complete reorganization of the highway system, at a cost of $15,000,000, the construction of 600 miles of highways, the building of a traffic tunnel under the Hudson River, and so connecting the city of New York with the great New Jersey centers of Jersey City, Newark, and the many other manufacturing cities along the Jersey side of the Hudson. The plan also embraces a bridge over the Delaware River, separating New Jersey and Pennsylvania, thereby connecting the highway systems of New York, New Jersey and Pennsylvania.

The first job for General Goethals calls for a reorganization of the New Jersey highway system, and he has announced that this will begin with the study of the existing systems and the administration thereof so that a systematic revision of the entire work can be carried out in 5 years. It is planned to defray the $15,000,000 expense by a personal-property tax, together with real-estate taxes.

A Modern Motor Road Needed

THE AUTOMOBILE, after observing the great development in the automobile industry during the last 20 years, and seeing in the near future the necessity for greatly increased highway capacity to take care of the automobile and motor-truck traffic, takes this opportunity of laying before its readers, and particularly those in New Jersey, a suggested plan for what it considers the required style of automobile highway. There is no better place to build the modern automobile highway than between the city of New York and the city of Philadelphia; there is no better State for this ideal highway than New Jersey, and there is no more capable man to handle such a project than General Goethals.

On page 682 we illustrate such a modern highway, a highway that is not an imaginary one, but such as is needed to-day between these two great centers of population. Here is a suggested highway approximately 100 feet wide, with three parallel roadways, two on the outside for automobiles and one in the center for motor trucks. This highway would have capacity on each of the automobile tracks for three or four motor vehicles abreast, and in the center roadway would be space for three motor trucks abreast. The automobile traffic on the outer roadways would be in one direction on each roadway, but motor trucks on the center roadway would travel in both directions.

Such an automobile highway would generally follow some existing roadway between New York and Philadelphia, 95 miles, but would be altered somewhat in the confines of the cities and towns. It would not be desirable to have such a three-track highway go through the center of such cities as Newark, New Brunswick or Trenton, but preferably it would skirt the outside of such places, thereby making the highway ideal for through traffic across the State of New Jersey, or between New York and Philadelphia. By keeping it outside of the cities and towns en route the delays due to local traffic would be avoided.

Through Traffic Requirements

The day of through-traffic automobile and motor-truck roads is at hand. The merchant who wishes to deliver merchandise by motor truck does not want his schedule held down by having to traverse the business sections of several cities en route. With such a modern highway a short distance from the business centers of these cities the time required to make the trip from the highway to the business centers will be more than saved by not losing time in traffic that would be lost if the highway passed through the business centers of all such towns and cities.

For through automobile traffic, and in fact for general automobile traffic, such a highway would prove immeasurably more serviceable by not leading the tourist through the congested sections of towns and cities.

The automobile is essentially a vehicle of speed. To-day its speed is needlessly hampered by narrow roads and congestion in towns and cities en route. If the automobile is to attain that full stature of efficiency of which it is capable, then the highway must be suited to the vehicle. The highway must admit of speed from end to end. You cannot get automobile or truck efficiency out of horse-capacity highways.

What is true of the automobile is also true of the motor truck. It must have highways on which it can travel at those speeds best suited for efficiency. With our existing highways the motor truck is not capable of exhibiting its possible efficiency. With such a highway as suggested in this issue this efficiency, and perhaps higher efficiencies not to-day deemed possible, would be within the reach of many truck owners. The motor truck has to increase, the economic development of the country demands it, but without adequate highways such development is impossible. Our great cities could not be served with our railroads if it were not for such four-track systems as the New York Central or the Pennsylvania; but while our railroads have been growing from the single, narrow-gage capacity of yesterday to the standard-gage, four-track systems of to-day our highways have continued on their single-track policies. These highways are scarcely any wider than they were years ago. We have not kept pace with national development in our highways. Our highways are largely the roads of yesterday, but our vehicles and capacities those of the twentieth century.

Such a three-track road as is illustrated should, as far as possible, have no grade railroad crossings. Either the highway must pass over the railroads or the railroads over the highway. It will be impossible to build such a highway without crossroads for vehicular traffic, but wherever possible crossroads should pass under this highway. Crossroads always interfere with fast travel of cars or trucks, and while the cost of subways under this highway may appear extreme, in the long run such construction will prove an investment. The illustration shows how subway crossroads have arc-shaped ramps leading onto the highway, so that vehicles enter the highway in the line of travel and not at right angles to it.

Must Build for Future

In New York City is a broad thoroughfare leading out from the north end of the city, known as the Grand Concourse. It is a wide street, with three separate roads for travel. The two outside roads are for motor travel and the inside one for other uses. Practically all trolley lines crossing this street, with one single exception, pass under the automobile roadway. This is a great advancement, and is a rational mark to aim at in big highway construction. We are yet only on the verge of the great automobile era. So great will be the use of motor vehicles that a great era of highway construction, on a par with our great railroad building, will set in. As yet, the vaguest plans for such a system have not been laid on paper. In our Atlantic and Pacific ports we have had to build new wharves for the ocean leviathans. It is not many years ago our ocean liners were large with 15,000 tons displacement. In a few years they jumped to 25,000 tons, then 32,000 tons, then 42,000 tons, and now they are

(*Continued on page* 692)

A fine example of Italian road where traffic regulation is of the utmost importance

Building Roads Through Battles

Italian Army Corps of 20,000 Men Constructs 4,000 Miles of Permanent Highways — Often Work Under Fire

By W. F. Bradley

¶EDITOR'S NOTE:—The following article is the result of 4 months' study of the Italian army's remarkable road-building work by Mr. Bradley, special representative of THE AUTOMOBILE *with the Allied Armies, who had unsurpassed opportunities for observing this work as he was driving an ambulance on this front during that time. The possibilities of rapid and permanent road construction under war conditions as outlined in this article render it particularly timely now when war is imminent.*

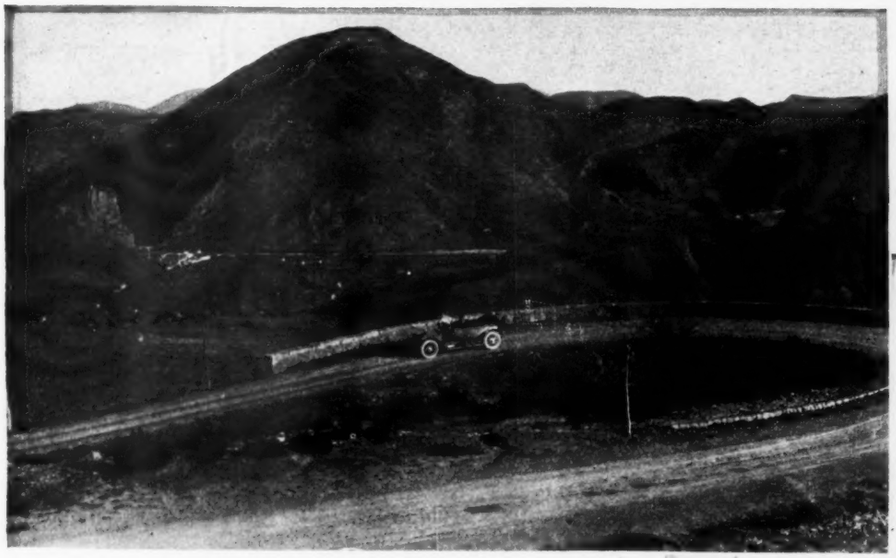
NAPOLEON stated once, that an army fought on its stomach, meaning that food supply was all-important. This is as true to-day as it ever was, but the greater size of the armies, the vastly greater expenditure of ammunition and the much more deadly nature of the fighting mean that the maintenance of supplies to an army in the field is a task far beyond anything that the great French leader can ever have imagined.

Yet Napoleon builded better than he knew in France, providing a network of roads which have made the French and British campaigns possible, just as that same system of highways enabled the German army to make its dash for Paris in 1914. In France the job has been chiefly to maintain the old roads, to repair damage rather than to build anew. In Italy a very different state of things prevailed; on a frontier line of about 500 miles there are snow-capped mountains as high as 13,000 ft., and only at the lower end of the line, near the Adriatic, do the heights drop to a few hundred feet. It is a work of years to build automobile roads over the Alps, and when they are built they cannot be used more than 2 or 3 months in each year. Thus, when Italy went to war against Austria she found a few well-made, beautifully engineered roads, but placed at very wide intervals, leading into the enemy's country. She found numerous mule tracks and a limited number of single-track railroads between even important centers. There appears to have been some convention between Italy and Austria regarding the building of railroads. The requirements of the populations just settled the highways; the few main roads were quite sufficient for international travelers, and mule tracks were all that were needed by the mountaineers.

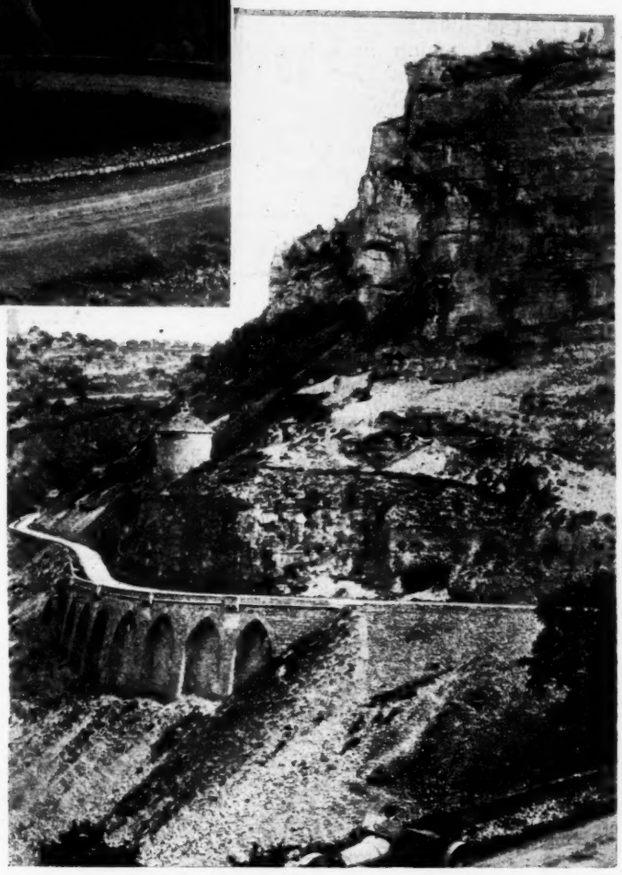
As Italy advanced into Austria—and she has advanced until at the time of writing she holds 1267 sq. miles of enemy territory—she had to build her own roads. She had to build many of the roads under shell fire, she had to blast them out of solid rock, and she had to pay as much attention to the embankments as to the road surface itself, so that heavy rains or snow would not bring down the overhanging earth and bury or destroy the road surface.

Officially Italy declares she has built 4000 miles of new road along the frontier and that she maintains an army of 20,000 men to keep her roads in repair. From personal observation these figures appear to be on the conservative side. No matter on what part of the front you travel the pick and shovel gang is to be found. They are right up in the fighting zone, within sight of the enemy, making new roads amid the indescribable

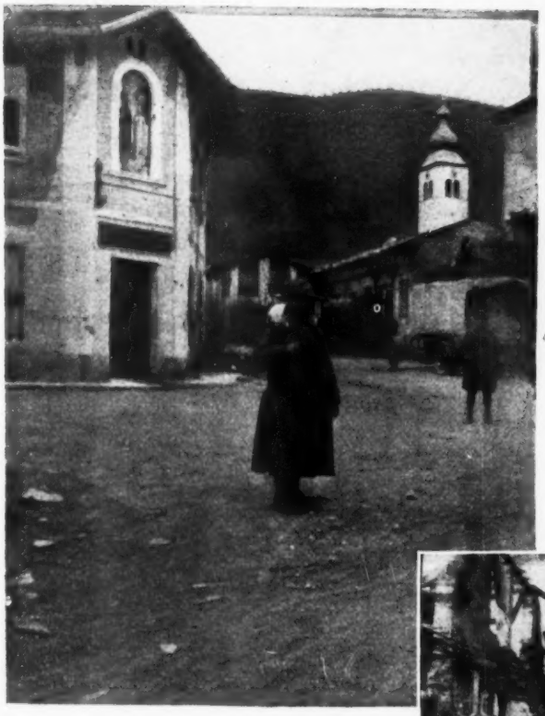
War Time Roads *on the* Italian Front



A scientifically designed hairpin on an Alpine road



An example of an Alpine road forming a ledge cut out of the face of the cliff



Above—A carabinieri, or traffic policeman, on duty at a cross road intersection which is frequently under shell fire

Right—This road is screened from enemy observation. Laborers are pulling down wrecked buildings and using material for road draining

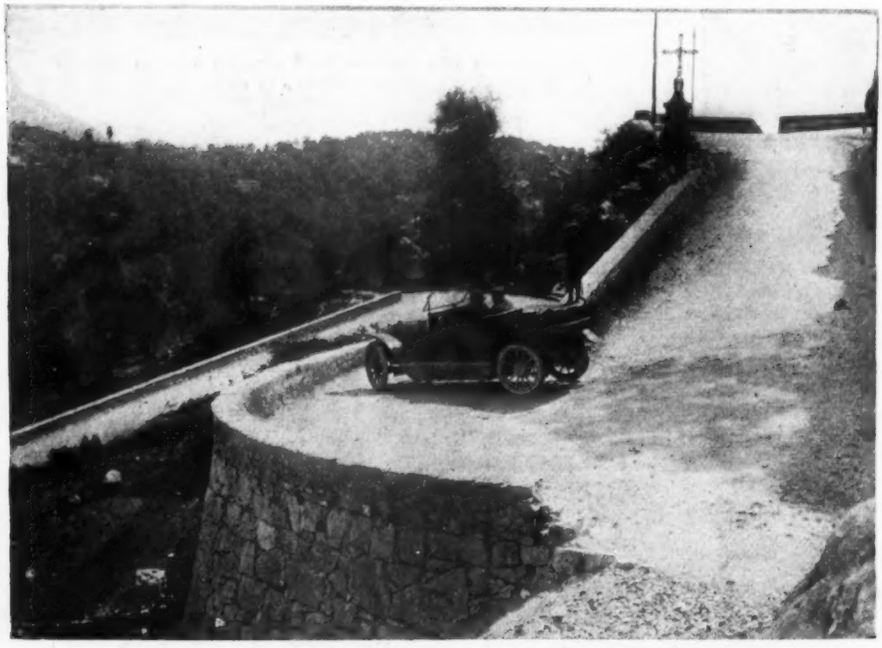
wreckage of the battlefields, and they are miles back in the rear, on the wealthy, luxurious plains of Italy, carrying out improvements which will facilitate the work of the army in its advance.

At certain times, and on certain portions of the front, the amount of constructive work which is being carried out, and the quantity of building material which is being sent up is so great that the thought arises: "This is not war; this is a huge contractor's job." But on this front the road makers and engineers are as important, if not more important, than the infantry. Naturally the men who advance with rifles in their hands get the glory, and deserve it; but if there had not been engineers to build the roads and to improve the roads as they advanced, the infantry would never have been able to make attacks.

A main road just after a battle had been fought over it. Compare this with the improvements shown in other illustrations

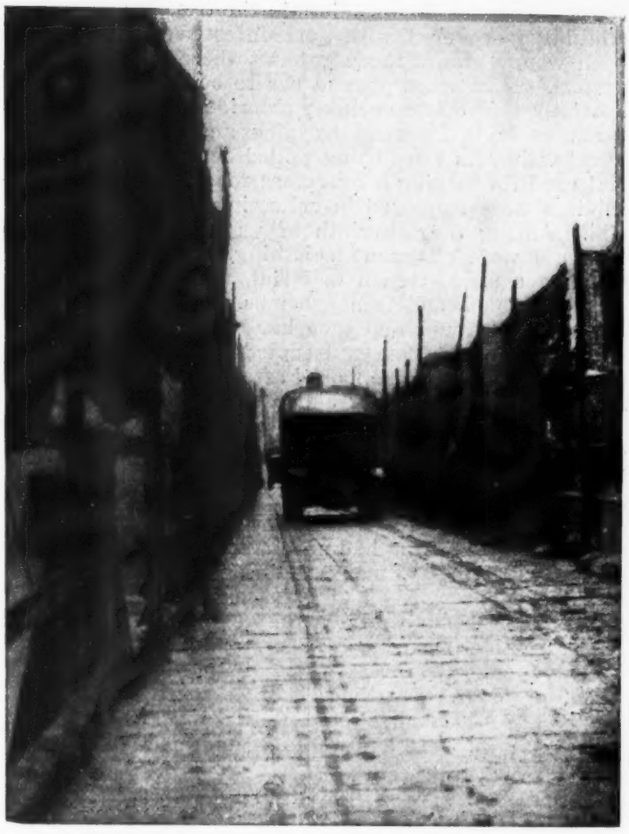
When it was known that Italy was going to join the Allies, a squadron of cavalry gathered a few hundred yards back of the frontier station on the main road from Udine to Klagenfurt, determined, as the clock finished striking midnight, to make a dash and capture the picturesque little village of Caporetto, only 3 miles beyond the boundary line. But the Austrian outposts very practically blew up 20 yd.—not more—of that main road and even cavalry could not pass. This road, one of the main highways, it must be remembered, ran through a narrow winding gorge, the Italian cavalry having on their right a vertical wall of rock and on their left a sheer drop of a couple of hundred feet to a deep mountain stream. They got through eventually, capturing Caporetto and also, in some miraculous way, the 8000-ft. snowy peak of Monte Nero, just beyond the village. But before they could do this the engineers had to be called up to bridge that almost insignificant gap, and the delay doubtless gave the Austrians all the time they wanted.

Quite unconsciously, an Englishman who had had no experience of the war, and had only been on the Italian front a few days, summed up the entire situation in a single sentence. An important position was held beyond the Isonzo River. The wood bridge being little more than the width of an automobile, served for ingoing traffic and a pontoon bridge carried all the outgoing vehicles. The Austrians constantly brought those bridges down, and the Italians just as constantly put them back again. To reach the pontoon bridge vehicles had to run down a narrow road on one of the steep banks of the river and run up an equally steep and narrow track on the opposite side. Under such conditions the least hitch was sufficient to arrest all traffic. Such a hitch had occurred, owing to a heavy truck getting off the center of the road and bogging in the soft earth on one side. In consequence a quarter of a mile of traffic could not move either ahead or astern. "Now, just look at that," exclaimed the inexperienced Englishman, "the whole Italian army held up by a bit of a lane like this."



A good example of difficult hairpin turns on a mountain road in the Italian Alps

Transportation is the greatest difficulty the Italian army has to contend with. It's no use blasting the enemy out of strong positions and sending the infantry forward to occupy those positions, if transportation conditions make it impossible to keep those troops supplied with food, water, ammunition, clothing, and the thousand and other things men



A temporary wood bridge on Italian front. Note screens to hide traffic from enemy view

in the field must be provided with. Before the army can make a move forward it must have a perfect set of highways behind it, and when it has moved forward it must immediately make roads over the country it has captured. The process is ever-recurring. First the country has to be blasted until it has lost all its original shape or distinctiveness, and when it has been captured it must be returned, so far as the roads are concerned, at any rate, to better than its original condition.

Civilians Employed on Roads

For roadmaking the Italians employ civilians—men either too young or too old for active service in the army—for the less dangerous positions, and special groups of soldiers for the making and maintenance of roads under shell fire. These workers, both civilian and military, appear to have a genius for roadmaking not possessed by laborers in any other part of the world. The younger members of the civilian gangs are mere boys, 14, 15 or 16 years of age; the older ones appear to be more than 60. They are brought from the interior zone in gangs under the charge of "carabinieri," or military police, and are divided up in groups in charge of a road foreman. They live in woodsheds near their work and are paid from $1 to $1.50 a day. So far as their movements are concerned, they are under the same strict discipline as soldiers, and of course are not allowed to move out of the district in which they are working.

Last August the Italian forces made a determined and very successful attack on the Isonzo front, capturing, among other places, the city of Gorizia, and penetrating into Austrian territory for a depth of about 8 miles. Months of patient preliminary work were necessary in order to make that advance possible, and since the advance, months have been spent in improveing the roads and making new roads in order to consolidate the position and bring about the conditions necessary for another attack.

One of the positions captured on the Austrian side of the Isonzo River could be reached by a single made road, and was also provided with a few mule tracks. A considerable portion of the main road had been in No Man's Land, and ran through a once substantial village which had been shelled until not a single one of its houses was worth rebuilding. That wrecked village, even when captured, was a serious obstacle to the victorious Italian army. Its main street at one point was so narrow that there had never been room for two vehicles to pass abreast. After the bombardment that narrow street was piled up with wreckage to such a height that nothing on wheels could get through. Even the market square was littered with wreckage over its entire area so that only a caterpillar or four-wheel-drive tractor could have got across it.

Highways Choked with Wreckage

The first urgent necessity was to clear that road so that the automobile convoys could pass through with supplies for the troops ahead. Gangs of men followed up right behind the infantry and had orders first of all to make a single-track passage through the wreckage. There were three traffic-congesting bottlenecks in that village, but there was no time to remove them; villages are built so solidly in Italy and Austria that even modern artillery cannot completely raze them to the ground. Further ahead there were abandoned trenches right across the road. These had to be filled up with the plentiful wreckage to be found on all sides. There were huge shell holes; there were landslides formed by embankments having been shot away. All these had to be filled up roughly, hurriedly, with no thought of rolling, macadamizing, or even making the surface reasonably smooth. A track had to be made across that chaotic wreckage, and made immediately, so that the advancing troops could be adequately supported in case the enemy launched a counter-attack.

Day by day and night by night the road gangs worked until that rough single-track road was improved and enlarged until in time it became worthy of the name of road, and, except when under heavy shell fire, could carry two steady streams of automobile and horse traffic. But the position was too important to be served by a single road. Before the war there had been a couple of picturesque, narrow mountain roads acting as auxiliaries to the main highway, but very little used except by the mountaineers. For a length of eight miles these two winding mountain roads had been fought over inch by inch, every square yard of the country being pounded with shells until it was impossible for a stranger to say where groups of houses had once existed, or to deduct from the meagre wreckage whether a stable or a mansion had once been on a particular site.

Opening the Road Quickly

It was important that these two roads should be opened for traffic with the least possible delay, in order to relieve the main road and make one-way trips possible for at least some of the convoys. The same system was adopted. First of all the bigger wreckage was cleared away so that sufficient width was provided for a single vehicle. As soon as this had been done, traffic was allowed to come through, but as there were gradients of 10 to 12 per cent conditions were the most

strenuous possible. For a week only pack mules passed over the road, but as soon as the surface was strengthened and the necessary width obtained automobiles were sent forward and were able to tackle the rough conditions before it was possible to move with horse convoys. For a time traffic was slow, and sometimes the road gangs had to give a hand to get trucks over the most difficult stretches. But traffic never ceased and the work of improving the road never slackened.

Ruins Used for Material

The question of material had to be solved. It was obviously impossible to bring up stone and other road material except by beginning at the Italian end of the road and working forward; further, the trucks employed for this work would have been an encumbrance, occupying space which could have been better filled by ammunition and food convoys. Instead, gangs of men were set to work to pull down the wrecked cottages and other buildings, and the materials thus obtained were used for making the roads. Blocks of granite which had once formed the walls of some centuries-old casteletto went to form an embankment for a modern highway, or would pave a gutter to carry away the heavy rains so frequent in this district. The smaller and more completely broken up material went under the hammer and was reduced to the regulation size of roadchips.

This work was not carried on without danger. The enemy was sufficiently near to have these roads under observation, and any unusual activity would call forth artillery fire. One of the first tasks, therefore, was to put up screens, roughly formed of rushes, along one or both sides of the road, and in some cases right across the road, at intervals of 30 or 40 yd., and sufficiently high for traffic to pass under them. The peculiar nature of the country was such that the enemy sometimes had a road under observation from left and right, as well as right down the length of the road. In a few exceptional cases it was necessary to paint a huge canvas screen, something like scenic decorations of a theater, place it in position at night and let men work behind it. Screened roads are found on all the European fronts, but are particularly useful on the Italian front, where the mountainous conditions often bring the two forces close together in a straight line, yet far apart if the natural contour of the country has to be followed. Screens constitute a safeguard not to be measured by their material strength. With the road hidden from observation the enemy will not waste his shells on haphazard firing.

Protection for Workers

It is quite common for the roadmen engaged in breaking stones to build a substantial sand-bagged dugout, or to make a small cave in the face of the cliff, and carry on their work in the mouth of this shelter. If the whistle of a shell is heard they move back a few feet, and are immediately in comparative safety. The men working on the open road usually have some abandoned cave into which they can dive if the enemy opens fire. They are also under instructions to seek shelter if an enemy aeroplane appears above, for not only is it undesirable that the enemy should know where work is being carried on, but falling shrapnel from the anti-aircraft batteries has to be guarded against.

These old battlefields are a hotbed of infection. For months men had lived in these human warrens; they had been buried there, and when the battle swept over the country, corpses were left behind in the hundreds. Experience has shown that if these road workers are wounded by shell fire they are much more liable to septic poisoning than soldiers in the trenches, for their clothing is covered with germ-infested earth and an open wound allows those germs to be carried into the system. Thus when ground has to be broken men are specially told off to sprinkle chloride of lime into the earth as it is loosened by pick and shovel. While wrecked houses were being pulled down and the material used for making a first-class road, other groups of soldiers were employed in collecting abandoned material. Among the labyrinth of wrecked trenches and dug-outs were abandoned clothing, haversacks, rifles, wrecked cannon, trench material, and not a few unexploded shells and trench bombs. These latter were collected in groups and then handed over to the artillery, who buried them and exploded them electrically. Other gangs of soldiers looked after graves, which were scattered singly and in groups over the whole country.

Thus, in a few months' time the entire nature of the country changed. Villages, composed of substantial houses built to last for generations, were wiped out of existence so completely that it was impossible for an observer to state where there had once been a street and where a dwelling had once stood. There remained a military highway, many well-filled graveyards, and some tenacious vines which refused to be buried in this scarred and battle-worn earth. The general plan of reconstruction lacked sentiment, and probably would not have met with the approval of the individual holders of property. But there is little sentiment in war, and to make a clean sweep of dwellings which could never again be used as dwellings, and make use of the material for roads, was much more sensible than to leave the wrecks for peasants to weep over.

(*To be continued*)

Italian roads are particularly liable to flood. Scene shows a group of civilian roadmakers on the road after a sudden storm

Special Cams Designed for Aluminum Engine of Premier

Expansion of Aluminum Cylinders Offset by Altering Cam Profile—Noise Reduced Without Affecting Timing

By A. L. Nelson
Chief Experimental Engineer Premier Motor Co.

¶ Following is a paper read before the Indiana Section of the Society of Automobile Engineers March 30, under the title of Overhead Valve Problem of Aluminum Motor. Owing to the progress of the aluminum motor and the problems accompanying this development this article is of unusual engineering interest.

THE day is not many years past when clearances between the tappet and the cam of 1/64 or even 1/32 in. were prevalent in valve mechanism design. Year by year this clearance has been decreased in order to quiet the valve mechanism till now 0.003 in. is not considered excessively close for some types of motors.

The reason for this reduction of clearance is that the motor speeds have been greatly increased and the standard of quietness of valve operation has been raised even more in proportion than the engine speeds.

The clearance between the end of the rocker-arm lever and the valve stem of the aluminum motor with valve-in-the-head construction and camshaft in the crankcase has an even more serious aspect than noise alone as will be pointed out later. The vertical expansion of the aluminum cylinder case is about twice as great as that of cast iron. Even for the cast iron construction the valve-in-the-head motor has gone on record as being a noisy type. Experience shows that with the ordinary type of valve mechanism, the aluminum motor is even more noisy.

It is the object of this paper to discuss the simplicity that the objections to the valve mechanism of the valve-in-the-head aluminum motor may be completely eliminated by a simple change of the conventional cam.

Difficulties in Conventional Cam

With the conventional type of cam adjusted with a valve stem clearance at the working temperature of the motor that would give satisfactorily low valve closing and lifting velocities, would hold all the valves open when the motor was cold. This may be explained by reference to Fig. 1.

Cam 1 operates lifter 2 and by means of lifter rod 3 rocker-arm lever 4 lifts valve 5. Rocker-arm lever shaft 6 is fastened to the cylinder head 7 by means of bracket 8. When the cylinder case 9 is brought to its working temperature it expands vertically more than the lifter rod, since the former is aluminum and the latter steel, and also because the cylinder has a wider temperature range than the lifter rod. This unequal expansion of these two members raises the rocker-arm lever shaft more in proportion than the top of the lifter rod. Now, assume that the motor has the desired valve stem clearance when hot. Then when the motor is stopped and cools, the reverse of the above expansion takes place, decreasing the valve stem clearance not merely directly as the difference of expansion but it is multiplied by the ratio distances *B* divided by *A*, which in our case is 2.348.

It was found by experiment that the valve stem clearance has to be at least 0.013 in. in order that the valves would retain sufficient clearance to start a cold motor. With this clearance and the conventional cam, the valves opened and closed with such high velocities that the valve action was entirely too noisy. The impact on the valve seats and on all the valve mechanism parts made the wear very appreciable. The clearances, though already bad would not hold up without frequent adjustment. It became necessary to make a radical change in the method of operating the valves. The simplest, and which, analytically as well as practically, proved to be the most satisfactory method, was worked out by a change in the conventional cam.

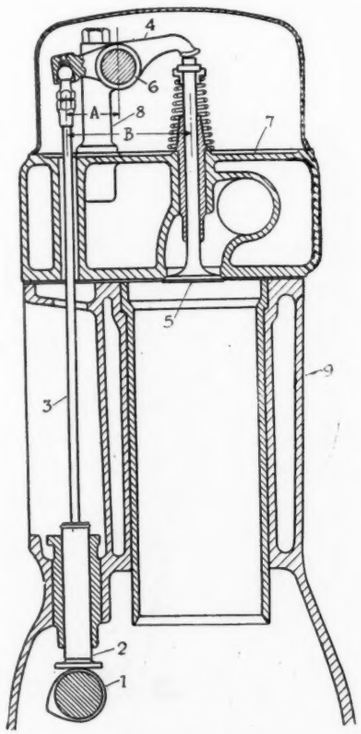


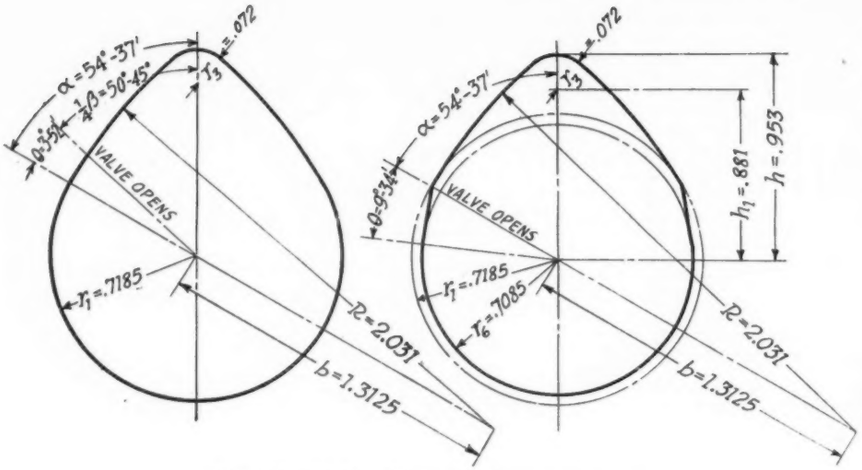
Fig. 1—Shows parts which expand

Comparison of the Cam Contours

Fig. 2a shows the conventional cam contour, while Fig. 2b shows the new. The new cam is virtually the conventional with 0.020 in. taken off the diameter of the base circle with a tangent drawn from point *A* to the new base circle. The time of opening the valve is made earlier on the new cam for reasons to be shown later, and in order to keep the mean valve lift the same. The lift of the valve for the added angle is only 0.004 in. while the angular increase is 3 deg. 52 min. That is, the first part of the lift is so slow that the valve has to be given an earlier start corresponding to the back-lash angle of the old cam.

As the valve stem clearance increases by wear the timing works towards the desired theoretical conventional timing and then past the same, instead of always away from it, as is the conventional method. This gives the new cam a wider range for careless adjustment or neglect.

The tangent from point *A* to the base circle may be replaced by a curve. However, the back-lash angle of the tappet will be materially increased, giving less space for the uniform base



Figs. 2a and 2b—Show alterations made to cam

circle, which inconveniences the making of the valve stem adjustment. The action of the new cam and the defects of the old can best be explained by exhibiting the mathematical analysis in the form of characteristic curves of the cam motion. For sake of completeness of these characteristics the acceleration curves will also be given, though they will not be discussed in this paper.

Analysis of Mushroom Follower Motion

The motion of the cam will be divided into three parts. Referring to Fig. 2b, the details of the cam are shown. Fig. 3 shows the cam out of scale to illustrate what will be called the "preliminary motion." This motion raises the tappet to take up the valve stem clearance. When point *A* reaches the centerline of the tappet the "lower motion" begins. This continues as long as the cam flank radius *R* is in contact with the tappet. The "upper motion" is that of the tappet while in contact with the cam peak radius r_3.

In Fig. 4 the tappet is shown in the "lower motion"; s is the space the tappet has moved corresponding to the angle θ, which the cam has turned through since the point *A* left the tappet centerline. From right angle triangle *MCG*, $GF = r_1 + s$ and angle $CMG = \theta$

$$\cos\theta = \frac{MG}{MC} = \frac{R-(r_1+s)}{R-r_1}$$

$$\therefore s = (R-r_1) - (R-r_1)\cos\theta = l(1-\cos\theta) \text{ inches} \quad (1)$$

The velocity and acceleration of the tappet will be obtained from equation 1 by differentiation. The velocity is the instantaneous time rate of change of the spaced pass over and the acceleration is the instantaneous time rate of change in the velocity. These relations expressed by differential notations are as follows:

$$v = \frac{ds}{dt} \text{ and} \quad (2)$$

$$a = \frac{d^2s}{dt^2} = \frac{dv}{dt} \quad (3)$$

where v and a are the velocity and acceleration of the tappet respectively. Expressing θ in radians, then for any constant angular velocity of the camshaft

$$\frac{d\theta}{dt} = \frac{2\pi N}{60} = \frac{\pi N}{30} \text{ radians/sec.}$$

Where N is the speed of the camshaft in r.p.m.

Then from equation (1)

$$v = \frac{ds}{dt} = b\sin\theta\frac{d\theta}{dt}$$

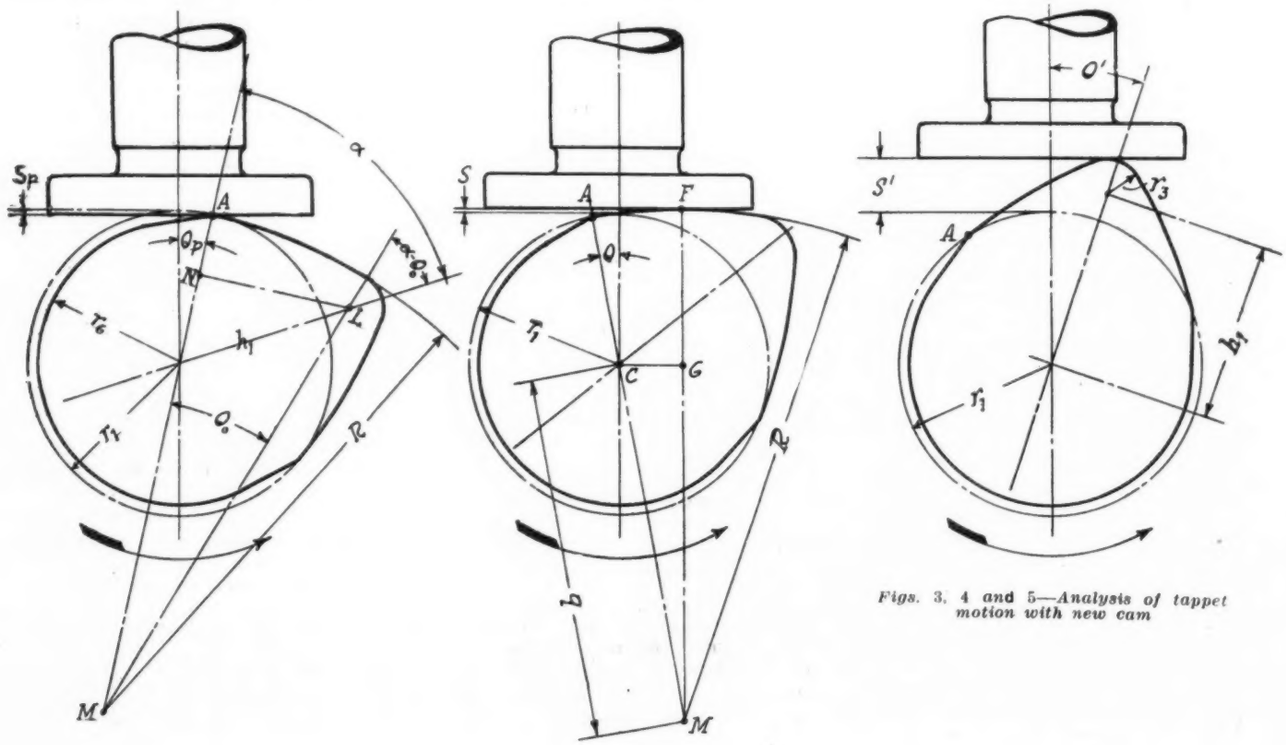
substituting $\frac{\pi N}{30} = \frac{d\theta}{dt}$ and dividing by 12 to get the result expressed in feet since the cam dimensions will be kept in inches.

$$v = \frac{\pi}{12\times 30}Nb\sin\theta$$

$$= 8.73\left(\frac{N}{1000}\right)b\sin\theta \text{ ft./sec.} \quad (5)$$

Differentiating equation 5 gives the acceleration

$$a = \frac{dv}{dt} = \frac{\pi}{12\times 30}Nb\cos\theta\frac{d\theta}{dt}$$



Figs. 3, 4 and 5—Analysis of tappet motion with new cam

$$= \frac{\pi^2}{12 \times 30} N^2 b \cos \theta$$

$$= 914\left(\frac{N}{1000}\right)^2 b \cos \theta \text{ ft./sec.}^2 \quad (6)$$

The velocity and acceleration of the valve is that of the tappet times the ratio of the valve lift to the cam lift. It must be borne in mind that equations 1, 5 and 6 only apply for values of θ within the "lower motion."

Equations for "Upper Motion"

In like manner from Fig. 5 the equations of the tappet for the "upper motion" are derived.

$$s' = (r_3 - r_1) + h_1 \cos \theta' \text{ inches} \quad (7)$$

$$v' = -8.73\left(\frac{N}{1000}\right) h_1 \sin \theta' \text{ ft./sec.} \quad (8)$$

$$a' = -914\left(\frac{N}{1000}\right)^2 h_1 \cos \theta' \text{ ft./sec.}^2 \quad (9)$$

Where S' is the lift of the valve after point A passes the tappet centerline, V' is the corresponding velocity, and a' is the corresponding acceleration. It should be observed that with the cam in position shown in Fig. 5, θ' is generated negatively, hence V' will be positive since of the sine of a negative angle is negative. However, a' will remain negative for the cosine of a negative angle is positive.

It follows from Fig. 3 that the maximum value of $\theta = \alpha - \theta_0$ and that, sine

$$\theta_0 = \frac{NL}{ML} = \frac{h_1 \sin \alpha}{R - r_3} \quad (10)$$

Again, in like manner and from Fig. 3, the equations of the tappet of the "preliminary motion" are derived.

$$-s_p = r_1(1 - \cos \theta_p) \text{ inches} \quad (11)$$

$$v_p = -8.73 \frac{N}{1000} r_1 \sin \theta_p \text{ ft./sec.} \quad (12)$$

$$a_p = -914\left(\frac{N}{1000}\right)^2 r_1 \cos \theta_p \text{ ft./sec.}^2 \quad (13)$$

Where s_p is the distance of the tappet from its position when point A crosses the tappet centerline, v_p is the corresponding velocity, and a_p the corresponding acceleration.

By means of the above equations the curves of Fig. 6 were drawn after calculating several points for each curve within each of the three motions described.

Cam Characteristic Curves

Imagine the cam turning anticlockwise just beginning to lift the tappet. This will be the starting point of the curves beginning at the left side of same. The initial velocity at 3000 r.p.m. of the motor is 1.564 ft./sec. In order to make this discussion applicable to any speed of the motor the velocity at any position of the cam will be given as a per cent of the maximum velocity that is given to the valve at that speed. Since the maximum velocity of the valve at 3000 r.p.m. of the motor is 8.50 ft./sec., then the initial tappet velocity is $\frac{1.564}{8.50}$ = 18.4 per cent of the maximum. As the cam turns further the tappet velocity decreases till point A, Fig. 3, comes on the vertical centerline, then the velocity becomes zero. This is the end of the "preliminary motion," and at this point the tappet has raised 0.010 or 0.0135 at the valve stem. This is the desired position of the cam to begin lifting and seating the valve, for the valve will operate with zero velocity, neglecting the deflection and deformation of the camshaft and valve mechanism parts, which are distinct problems aside from the discussion of this paper.

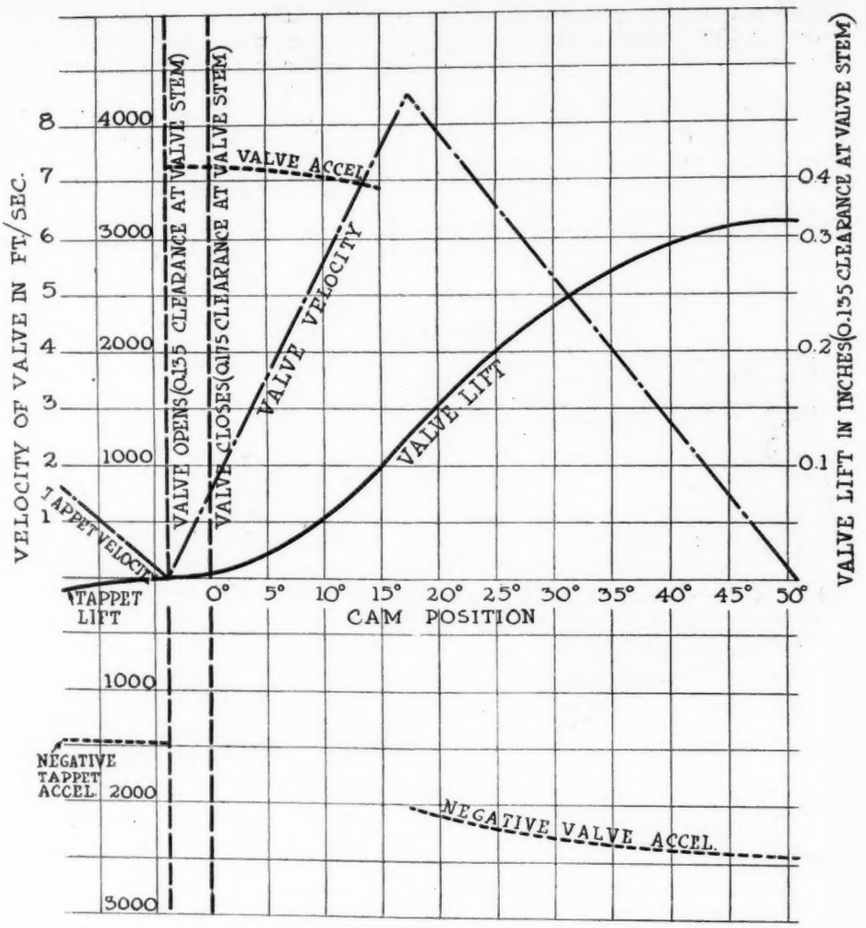


Fig. 6—Velocity curves for valve and tappet

As the point A, Fig. 3, passes the tappet centerline the "lower motion" begins. The velocity starts at zero, increasing rapidly to its maximum.

As has been pointed out, point A, Fig. 3, is really the starting point of the back-lash angle of the old cam. In order to keep the mean valve lift the same as that of the conventional cam the back-lash angle of 3 deg. 52 min. is added to the old timing. The tappet raises only 0.003 in. for this angle, and does not practically give a change in the desired timing as far as the actual lifting and closing of the valve is concerned.

It is at this 0.003-in. lift of the tappet corresponding to 0.004 in. at the valve that the old cam was designed to start opening the valve. The valve velocity at this point is $\frac{1.553}{8.50} = 18.26$ per cent of the maximum. All this is an increase over the velocity obtained by the new cam as the valve opens and is independent of the location of the camshaft or the type of motor. For our aluminum motor the above is not the worst condition when operating with the conventional cam for the clearance of 0.004 is only about one-third of that required, namely, 0.0135 in.

For a clearance of 0.0135 for the conventional cam the valve velocity is $\frac{2.865}{8.50} = 33.7$ per cent of the maximum. In other words, an increase of 33.7 per cent over that of the new cam.

These velocities are so high that it made it imperative to reduce them very materially. In the new cam is

obtained a large reduction without increasing the manufacturing cost of the valve mechanism regarded as a whole.

For an aluminum motor the valve stem clearance must be adjusted when the engine is at its working temperature. This takes care of other inequalities, as exhaust valve stems expanding more than the intake and other peculiarities of expansion and contraction which are impossible to provide for in adjustments made on a cold motor.

Furthermore, since the use of the thermostat has become practically universal, the working temperature is held quite constant during the operation of the motor, a condition which is taken advantage of in the new cam design, enabling the valve stem adjustment to be made of an amount under working conditions that operates the opening and closing of the valves at a cam position giving practically zero velocity at any speed, making a clean cut of 100 per cent reduction in opening- and closing-valve velocities over that of the conventional type of cams.

Darling Car to Sell Under $2,000

As announced in THE AUTOMOBILE *last week, the Darling car, to be made in Dayton, Ohio, in the old Wright-Martin plant, will have one chassis with several bodies. The illustration shows the first body model, and it will be seen that the lines are entirely up to date. The price is not yet fixed, but will be under $2,000.*

The chassis is made up of standard units of known quality, such as Continental engine, Borg and Beck clutch, and Timken axles. It is to be well equipped with Kellog tire pump, Boyce Moto-Meter and similar refinements.

It is stated that the straight-line effect seen in the cut is carried through the other body styles as well, and that all the different models will fit the 130-in. wheelbase chassis.

Stewart Instrument Board for Fords

A NEW Stewart instrument board of black enameled wood for Ford cars has been brought out by the Stewart-Warner Speedometer Corp., Chicago, to replace the former board which was made of steel. The new board, which carries a Stewart speedometer mounted flush and set off with a nickel flange, is installed by pulling the steering column down slightly and springing the board in place, no bolts, screws or brackets being required. The upper end of the board is grooved to fit the cowl just below the windshield and as the board rests against the steering column it eliminates vibration from the steering wheel. As the board is of wood, the Ford owner can mount his clock, headlight switch, priming lever, etc., within easy reach. The Stewart instrument board, in combination with the Stewart speedometer, sells complete for $11.25.

Goethals To Build N. J. Roads

(*Continued from page* 683)

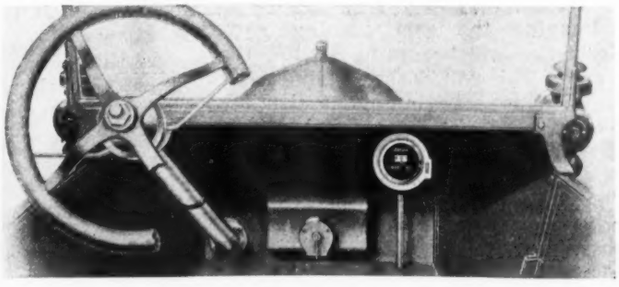
over 50,000 tons. We dredged channels and built docks to accommodate them. So with our highway systems. A stone road sufficed for horse traffic, but is useless for motor traffic; and yet many States continue to build horse roads for motor uses. Take a leaf from marine practice, and the sooner we build the motor highway for motor traffic as we have it to-day, and will have it to-morrow, the sooner will we be keeping pace with our national development. To-day road building is lagging sadly behind.

Today, New Jersey has a total road mileage of 20,445 miles, of which one-quarter are unimproved. Another quarter can be classed as graded roads with the earth arched so as to drain off water. Of the improved roads, the division is as follows: Gravel, 2500 miles; macadam, 3100 miles; bituminous macadam, 472 miles; brick, 143 miles; shell, 88 miles; concrete, 15 miles. There are 544 of bituminous concrete, 704 miles of sand, clay, etc., 310 miles of stone block and other miscellaneous kinds.

New Jersey occupies the distinction of being one of the first States to adopt the policy of State aid in road building. This work was begun in 1892, and up to Jan. 1, 1914, 1833 miles of State-aid roads have been completed at an outlay of $5,800,000. The cost of road building is going up each year, as evidenced by a cost of $10,000 per mile in 1910 as compared with $25,000 per mile to-day.

Preliminary Mathematics

THE night school student who is trying to improve himself does not need quite the same sort of text book as does a child. Preliminary Mathematics, by Prof. F. E. Austin of Hanover, N. H., published at $1.20 by the author, is a simple, condensed and very clear volume which might be most easily described as explaining the theory of everything from simple addition to quadratic equations. A very large number of examples are given, these being chosen so that the method followed in solving the problem is easy to grasp.



New Stewart instrument board for Fords

More Efficient Truck Engines

Low Fuel Efficiency and Increasing Cost of Fuel Are Truck Industry's Most Serious Problems—Need for Fundamental Changes — Possibilities of Dual Fuel System

By A. Ludlow Clayden

ORIGINALLY the expectation of inventors of mechanically propelled vehicles was that they would be used mainly for the transportation of goods. Few of the pioneers appear to have foreseen the coming of the "pleasure" car; yet it is a common habit to regard the commercial vehicle as a child of the passenger car rather than as the parent.

But whatever happened at the start, the fact remains that the motor truck to-day is made up from a number of units of which nearly all were developed for passenger cars first, and were adapted to truck service later. Probably the closest similarity between the two was to be seen about 6 years ago; to-day it is far less marked, and we have reached a stage where experience on the passenger car side of the industry is of continually decreasing value to a truck engineer.

The similarity was greatest when the truck and passenger car engineers had both the same ideal to make a machine that would run and stay running. In these days, with the fundamentals that make for reliability all settled, the large, essential difference between the passenger car ideal and the truck ideal is perceptible.

Performance versus Cost Thereof

Perfection of performance is the passenger car ideal. Minimum cost of operation that of the truck. The two are antagonistic to a considerable degree.

Professor Fishleigh, in his paper on heat losses, read in January of this year, showed that "reserve power," meaning the normal operation of an engine at low throttle, caused about 90 per cent of the fuel consumed to be wasted utterly. The conditions in a truck engine are not quite so bad as this, but they are bad enough, and the effort of the moment seems in one sense misdirected. This is to the extent that in striving for the heavy fuel engine we are seeking a motor which will use something cheaper than gasoline, allowing us to continue to waste fuel without noticing it. If we could raise the thermal efficiency of the gasoline truck engine it might be cheaper to run than a kerosene engine with the same efficiency as the gasoline one has now. Of course, the ultimate ideal is both a more efficient engine *and* one that will burn cheap fuel combined.

This may be said to be the principal problem of truck engineering to-day. Beside it all questions of transmission, of wheels, of tire equipment and everything else pale into insignificance. Not that there is not improvement to be made between the engine and the road, there is, but that the opportunity for betterment is vastly greater in the engine than elsewhere.

It is always dangerous to suggest that anything which is accepted practice is wrong fundamentally, but to give an example of possible change it is hard to believe that throttle control is really the best possible way of handling even the engines we have. It is far the simplest way of controlling engine speed, but it is very wasteful because as soon as the compression drops in the cylinder the nature of the combustion that takes place is altered greatly for the worse. This is just one thing, and it would not seem impossible to discover some adaptation of the hit and miss governor always used on stationary gas or oil engines which would make a practical control for a truck motor. Yet for years no serious attempt has been made either in America or Europe to find something as effective as the throttle and less wasteful. Of course, there are many reasons why the stationary type hit and miss could not be used as it stands, but surely we could vary speed and still have full compression for each charge; it is not very difficult to design an engine with a variable combustion chamber the variation being accomplished in conjunction with throttle operation; there have been such engines but no one treats them seriously.

Why Not Two Fuels?

Then, on the heavy-fuel side of the question we have the starting difficulty. Instinctively we balk at the provision of means for heating up something before a start can be made; we hesitate to consider an engine that will not start or run below 250 r.p.m. Yet a first cost of $100 or so could even now provide an engine with preheating and high-speed starting equipment with which the fuel bill for daily operation might be reduced a third or more. Even the provision of a small tank for light fuel for starting and a larger tank for the heavy-running fuel is not getting the consideration it deserves. Here a possibility, which might be made a practicality, is a thermostatic control which would change over from one fuel to the other at the right point, without the driver having to think about anything except keeping the tanks filled.

There is no more fundamental objection to the use of two fuels than there is to the use of a fuel that is not also a lubricating oil. We have the habit of handling both fuel and oil, it would make no real difference to anyone if we had to handle as much "starting fluid" as we do oil and it would very speedily become no more tax on the memory than does the need for periodical refilling with oil. It would in any case be less trouble than the need for constant oil changing due to crankcase deposits of kerosene as mentioned by H. L. Horning in his letter in The Forum.

Ultimately it may not be necessary, we may and in fact we no doubt shall, discover how to use a heavy fuel at least as easily as we now use gasoline of good grade, but it is always necessary to learn to walk before running and by refusing to try out anything short of what seems perfection we are putting off the day when perfection will arrive. It is far more probable that we shall reach the ultimate type of engine by slowly changing the present type, than by suddenly giving up everything we know, and of which we have experience, for something altogether new and strange in the infancy stage of development.

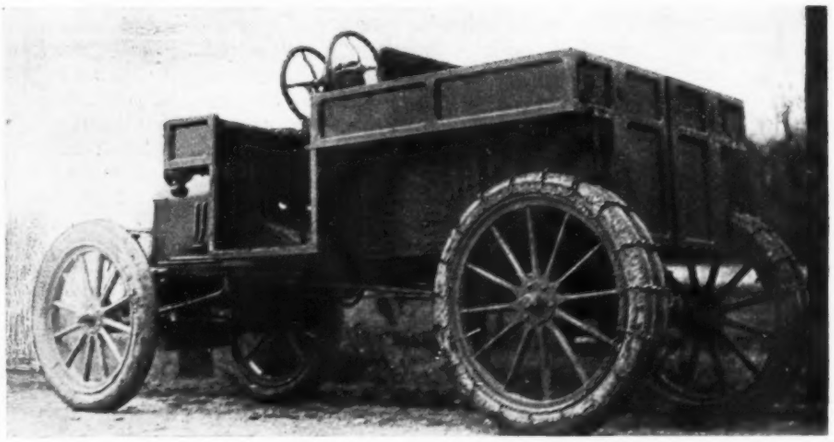
The cost of operating trucks has gone down and down as they have been made better, the cost of fuel has even

now not assumed the full proportion to the total cost of operation that it will bear ultimately, but a further rise in fuel prices cannot very well fail to cause a rise in total cost. We cannot cut tire costs and repair costs fast enough to keep pace with a rising price of fuel.

The writer wishes to disclaim any desire to make out that the situation is alarming. Far from it, the situation has never been better, as there are many agile brains working on the problem, but engineers and truck manufacturers can help enormously by not promptly turning down "freak ideas" without trying out a good many of them. The right attitude just now seems to be one of acceptance of the fact that we have got to make some fundamental changes. If this be agreed, then the quicker we discover what those changes are the better for the whole industry.

Double-Steer Artillery Tractor on Ford Chassis

AN ordinary Ford chassis has been modified to act as a tractor in connection with artillery batteries. The transformation was carried out by an artillery officer who has had considerable experience of gun transportation with all kinds of European and American tractors specially built for this class of work. As the result of observation, the officer was led to the conclusion that what was needed was a very light tractor capable, by reason of its lightness, of traveling over all kinds of broken country and of getting into positions which could only be reached by heavier machines at the expenditure of considerable time and labor. The tractor was intended to do most of its work through its winch, and not by direct haulage. Such a machine would show its greatest usefulness in the final placing of guns, rather than in haulage on the roads. The work of placing guns is now done by the big tractors, but as they are heavy and cumbersome machines they do not show their greatest usefulness in this sphere. The light Ford type, being able to move about quicker and to operate in much more cramped quarters, would, it is claimed, be a more suitable machine for placing guns.



The Ford artillery tractor. Note unusual body and dual rear tires. The tractor is designed more for placing guns than for heavy hauling

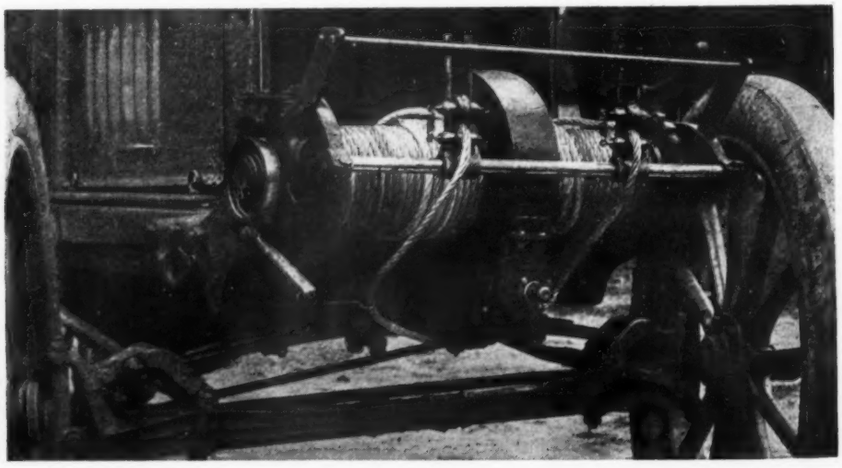
How Change Was Made

The transformation comprises widening the track, fitting larger diameter wheels with twin pneumatic tires on the rear, adoption of radius rods for front and rear axles, fitting double steering and control, placing of the winch across the front of the frame and the increasing of the radiator capacity.

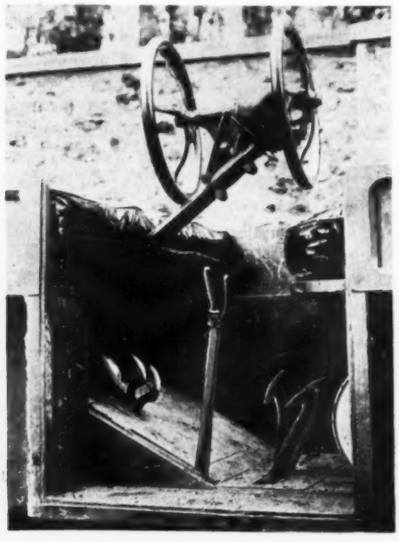
As shown in the illustrations, the winch is carried in brackets bolted to the front end of the main frame members. Power is transmitted from the front end of the crankshaft to the winding drum by means of worm gearing giving a very low reduction. The gearing is encased. Sixty yards of steel cable is used, it unwinding from one half of the drum and winding up on the other. A powerful ratchet and pawl is fitted and there is also a friction brake on the drum.

Double steering and control have been adopted. The steering has been very neatly carried out by retaining the standard Ford steering column but mounting a short horizontal shaft on its head, with a bevel pinion meshing with a corresponding pinion on the column. There is a vertical Ford steering wheel at each end of this shaft. The three Ford pedals have been duplicated. For reverse work the driver merely changes over from the facing-forward seat to a second seat ahead of the steering column, where he finds a steering wheel, throttle and ignition control and a set of pedals facing him.

The tractor has been successfully tried out under very severe conditions on one of the European battle fronts.



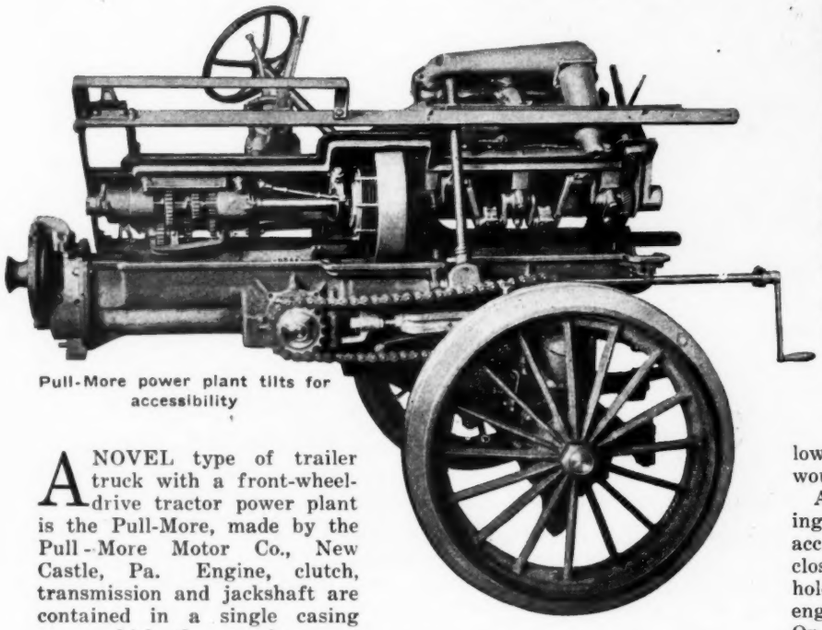
The double-drum winch driven off the extended engine camshaft



The double steering wheels and controls

Front Drive on Pull-More

Two-Wheel Tractor Unit Hauls Detachable After Part—Power Plant Accessible



Pull-More power plant tilts for accessibility

Illustrating Pull-More flexibility. Note steel wheels

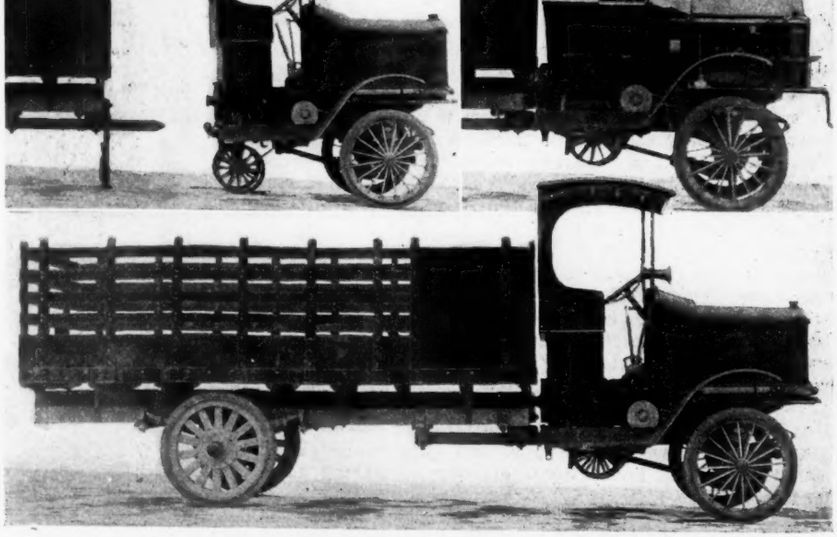
A NOVEL type of trailer truck with a front-wheel-drive tractor power plant is the Pull-More, made by the Pull-More Motor Co., New Castle, Pa. Engine, clutch, transmission and jackshaft are contained in a single casing upon which the steering gear and the driver's seat are mounted. Full elliptic springs connect the power unit to the front axle, and the front wheels are driven by chains from the jackshaft ends operating a bevel combination in the steering knuckle and so driving the front wheels. This bevel gear is very much like the usual speedometer swivel, only, of course, on a much larger scale. The chain sprocket drives a bevel meshing with another on the top of an idler shaft coaxial with the steering knuckle; at the bottom of the vertical shaft is another bevel pair, the last gear in the train being fixed to the stub axle of the front wheel.

It is stated that steering is very easy and that the machine is easy to remove from soft places, as a slight working of the steering wheel will allow the front wheels to take a bite at some other point. The fact of power going through the wheels does not affect the steering in any way, owing to the differential on the jackshaft and the perfect compensation for steering movement given by the bevel combinations in the knuckles. The motion of the front axle relative to the power plant is controlled by a yoke projecting rearward and by the radius rods which take the pull of the chains; the latter when driving have the slack side on top, which is correct for the best conditions of chain service.

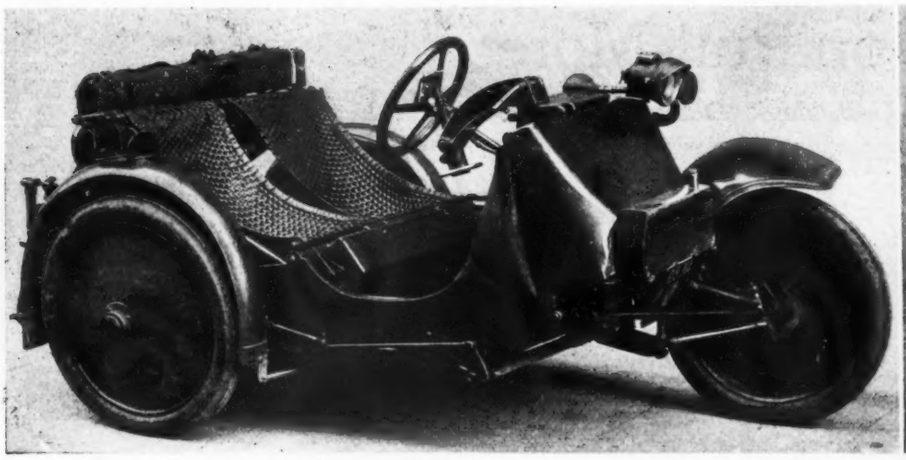
For connecting the tractor and trailer there is a centrally disposed bar, making an attachment that is rigid against bending, but free to swivel. This means that lifting one wheel only affects the particular axle to which it is attached and transfers no twisting stress to any other part of the vehicle. The rear axle is a plain, dead one and the greatest latitude of design is permissible with regard to the trailer. A platform as low as 18 in. from the ground is possible which would be very useful for certain classes of goods.

A peculiar method has been adopted for mounting the engine and transmission, so that they are accessible. The lower half of the big casing inclosing all the parts is practically a base plate holding only the jackshaft. All the rest of the engine and transmission is set in the upper half. On the left side the upper and lower parts of the case are hinged together, and on the right there is a screw gear for raising or lowering the top part, so that the whole of the underside of the motor and all the transmission can be laid bare for inspection or adjustment.

Tractor and trailer are readily separable, the tractor having supplementary wheels which can be lowered to support the rear end, and the trailer being provided with legs. This, of course, allows one tractor to handle any number of trailers one at a time. For regular hauling between two points the tractor need never be idle if it has three trailers.



Upper left—Front Pull-More unit detached. Upper right—The units coupled and power plant exposed. Below—Complete vehicle



Scott gun-carrying car. Left shows hammock seats and details of steering layout. Right is gun dismounted and set on tripod for use apart from machine

Machine Gun Scout Car

British Vehicle For Carrying Machine Gun Developed From Cycle and Sidecar Outfits Used Early in War—Built of Interchangeable Units

QUITE at the opposite end of the range from the tank, the motorcycle gun carriage has played a big part in the war, especially in the early stages when large numbers of motor bicycles were fitted with special side cars taking a small machine gun and its operator. The Scott two-track three-wheeler is a development from the sidecar combination, being really built for the job, and, although its appearance is somewhat peculiar, the construction is very far from freakish when the reasons for it are examined.

The first question is, of course, why three wheels? The answer is that: 1—Weight is saved; 2—the machine will turn in a trifle more than its own length, eliminating the need for a reverse gear and allowing a scout to turn round and make for his base instantly, and 3—the third wheel being a weight carrier only and not a driving wheel the machine can travel over very rough surfaces, such going causing no distortion of the frame. War service proved that the motor bicycle and sidecar could do much work that small cars could not and the Scott is a scientific development of the sidecar idea.

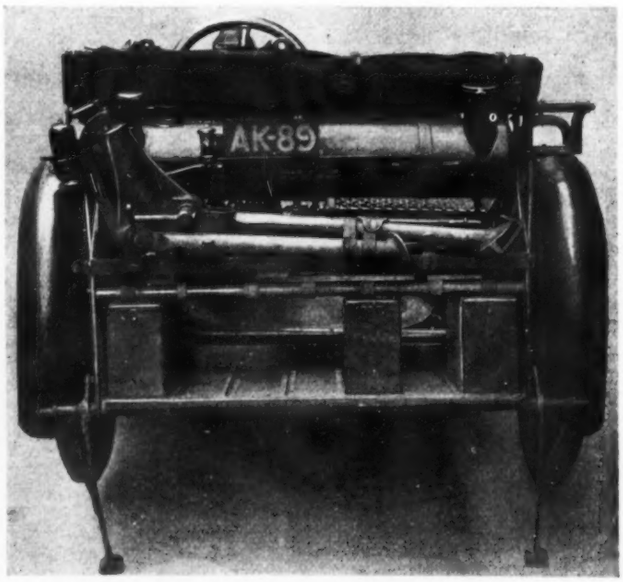
Frame Made of Units

The most interesting feature is the frame, which is made up from tubes of three lengths only. Each tube has an eye piece at each end, and the different tubes are bolted together by means of the eyes. This means that by carrying three spare tubes, any tube in the frame can be replaced rapidly. The front portion of the frame which carries the front wheel is hinged to the main frame, and is also made up of three unit lengths of tube. It is claimed that it is possible to assemble the whole frame in 15 min.

Ease of replacement is also seen in the springs as these are all spiral type and in tension, the swing bracket which carries the front wheel being linked to the main frame by one set and the rear axle controlled by another set of coil springs hooked on the respective parts. British writers who have used the machine state that it is very comfortable on rough roads, and the European rough road closely resembles a piece of old brick road, than which there are few more severe tests. No doubt the comfort is due in part to the seating arrangement seen in the illustrations, and this hammock design also saves weight and helps in erecting or tearing down the machine.

Scott is a maker of two-stroke motorcycles, so he uses one of these power plants, but any compact little engine and gearset would be applicable. In the machine illustrated the engine is 3 in. bore and 2½ in. stroke, rated at 5 hp. Three speeds are provided in a casing integral with the engine, the ratios being 5, 7.8 and 14.8 to one. The power plant includes magneto and everything except the radiator, so that it is a simple matter to put in a complete new unit. Drive to the rear wheel is by propeller shaft and the final drive a bevel.

The brakes are laid out rather curiously. On the wheel driven by the engine is the hand brake, this being expanding and inclosed. On the side wheel, which is a free wheel, the foot brake is mounted, this being the same dimensions as the hand brake, but there is no interconnection. The idea is that the foot brake is most used, and the engine also has a braking effect, so that the engine brakes one wheel while the brake acts on the other, so preventing any effect on the steering. An English commentator advises that both brakes be applied together when pulling up quickly, saying that there is a little



Rear view of Scott car with gun packed away

practice required to get the balance correct so that the pull on the steering is not produced.

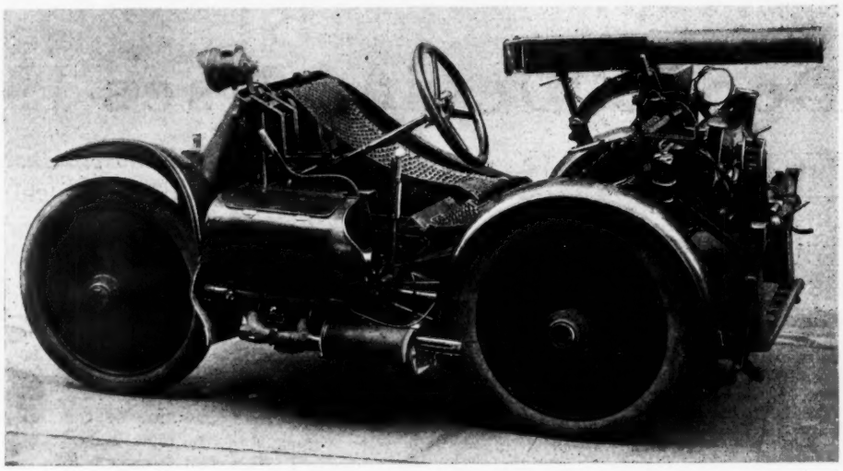
In mounting the gun it is so arranged that it can be fired forward or aft, and the passenger's seat is reversible so that the gunner can sit either way. In a moment or two the gun can be taken off the machine and set on legs. The weight is half a ton made up as follows:

	Lb.
Gun and 1500 rounds	205
Gun tripod	48
Two men	308
Complete machine	476
Spare wheel and tire	22
Spare parts for machine	20
Total	1,079

The construction of the machine is covered by American patents which are in the hands of Peter A. Frasse & Co., New York City.

The Scott machine has also been made as a passenger car without any regard to military service, and in this form it carries top, windshield, etc., making up into a very attractive appearing little car. Even on the good roads of Europe there is always disadvantage in having a three-track machine, like the early motor tricycles, and the later "tricars" with two wheels in front and one driving wheel at the back were troublesome on this account, and also because the tire of the driving wheel was very inaccessible. On the Scott all the wheels are interchangeable and the tires all alike. The gun car is usually provided with 26-in. tires, but it is suggested that an American model would be suited better by a slightly larger size. Perhaps 28 in. would be enough or it might even be advisable to use the Ford car size.

In any case there is no particular limitation upon dimensions, but it is naturally an ideal to keep the size and weight as low as possible, because it is the possibility of lightness and compactness that makes the car so useful for scout work.



Showing seat reversed for gunner and gun ready to fire toward the rear. Engine casing and disk wheels also are observable in this view

Cost Is Low

So far as cost of construction is concerned it is calculated that a machine could be built in very moderate quantities in England by English methods, to sell for $500, which is about equal to the cost of a really first-class motor bicycle and sidecar in that country. Made in quantities in America, it is probable that $300 would be possible, even using the best of material and perhaps a smaller sum still would suffice for its construction.

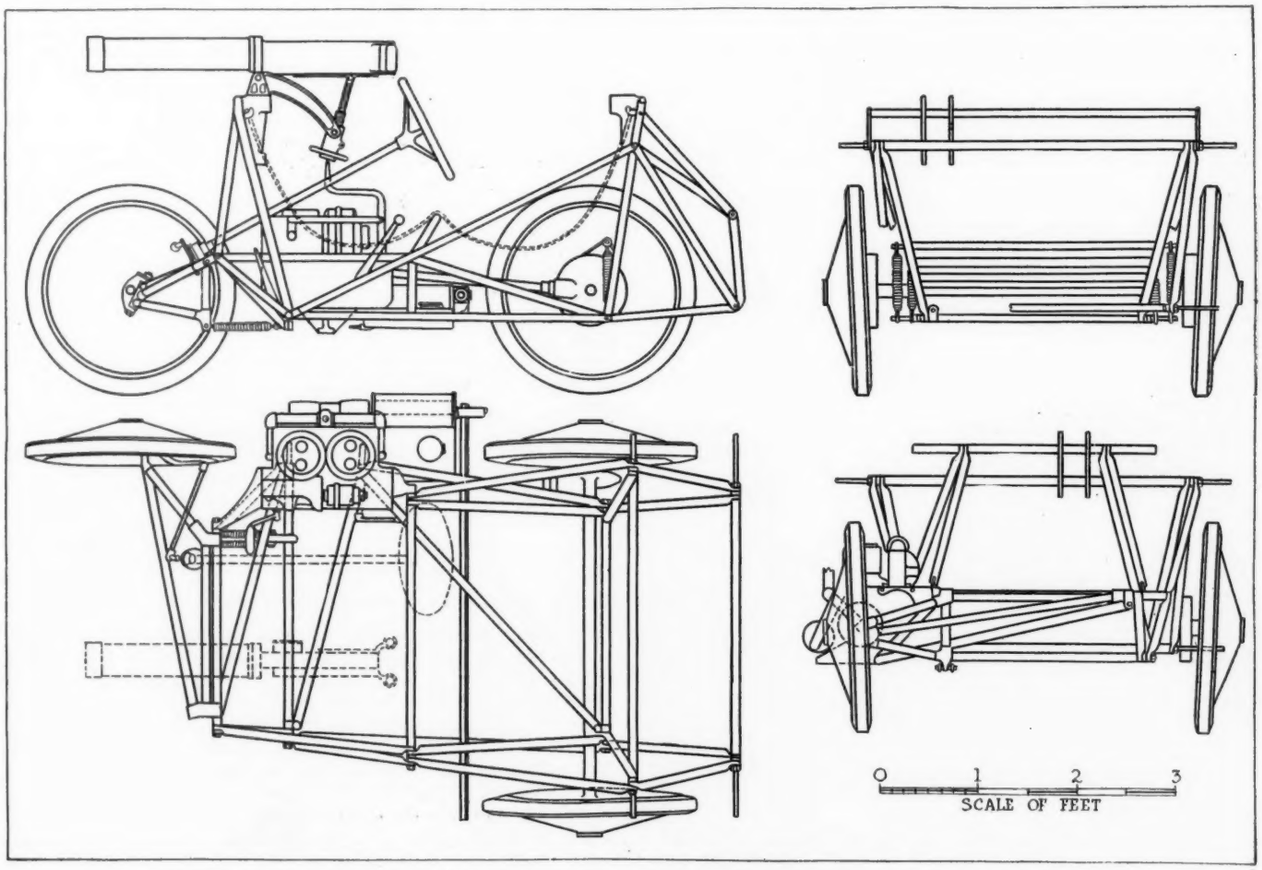
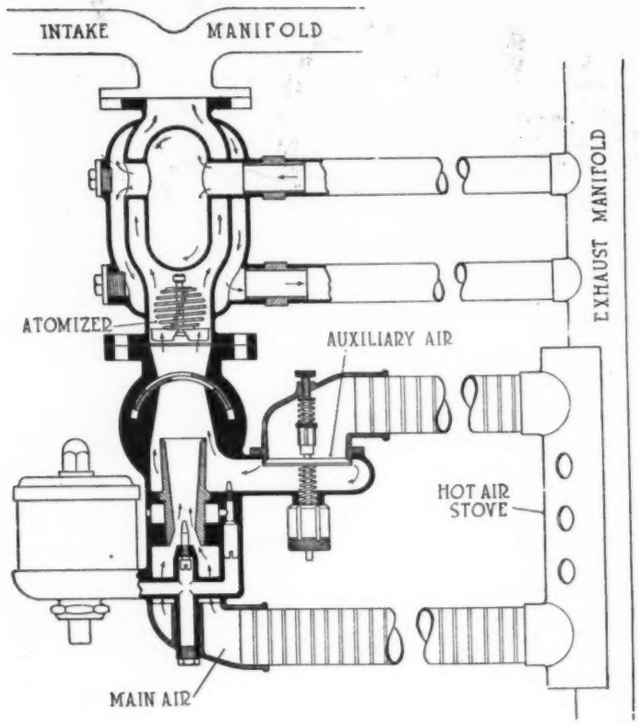


Diagram of frame construction of Scott gun car. Only three lengths of tube are used in it, and they can be replaced in a few minutes if damaged

Deppé Device Uses Heavy Fuels

Combines Carbureter To Mix Fuel and Air, Mechanical Atomizer To Break Up Mixture and Heater To Keep It Dry



Section through Deppé device, showing carbureter arrangement for heating the fuel and air and the mechanical atomizer in the form of a whirling fan placed above the special center-opening throttle

THE Deppé apparatus for supplying gas to an automobile or other engine is hardly to be called a carbureter. It combines the functions of carbureter and vaporizer in an entirely distinctive way and is claimed to operate on any mixtures of hydrocarbon oils above the lubricating oil cut. It will use fuels with no light fractions, but to do so requires a starting attachment. On mixtures containing about half to one-third the normal proportion of light fractions it starts readily from cold.

The device incorporates three main ideas. First the carbureter which meters the fuel and air in proper proportions and mixes them partially; second a mechanical atomizer which "beats" the wet mixture and breaks up the liquid into much finer particles; third a heater which warms the mixture sufficiently to insure that the gas remains dry.

Preheating Fuel and Air

First of all, before entering the carbureter, the air is heated to a considerable temperature. By taking up the liquid, and still more by the action of the throttle, this temperature becomes reduced and the amount of reduction is in proportion to the throttle opening. It is this fact which has made it so difficult to stabilize heavy fuel mixtures, since the temperature drop after passing the throttle causes the liquid to condense again. In the Deppé device the mixture as it passes through the throttle impinges upon a small fan surrounded by a wire cage, as shown in the cut. Drops of liquid which form as the mixture comes through the throttle are caught and broken up instantly by this fan, which is, of course, driven by the gas flow itself.

However, though this gives a good mixture there is still plenty of time for it to deteriorate again before the moment of ignition is reached, so the next stage is to "superheat" the gas. To do this by passing it through a tube heated on the outside takes an appreciable time because the heat has to pass from the outside to the center of the column of gas and gas is not a good conductor, while convection opportunities are small in a rapidly moving stream of air. Thus Deppé spreads the mixture out over a large area by sending it through a bulb-shaped chamber with an egg-shaped vessel inside it. Both the outside of the bulb and the inside of the core are jacketed with exhaust gas, so the mixture is warmed from both sides simultaneously.

Breaking Up the Globules

The first stage, that of obtaining a fair mixture by supplying hot air to the carbureter, is easy, and the heating after throttling is easy, but the function of the whirling fan in the throttle opening is perhaps the most important and for the following reason: If the mixture was allowed to pass straight from throttle to heating chamber, it would contain large drops of liquid, and these would not be fully evaporated without the application of a great deal of heat. The high degree of heat needed to vaporize the globules in the limited time available would crack them instead of evaporating them and produce gummy deposits. But the fine mist made by the fan behaves quite differently, since it is possible to heat it without damage to the chemical constitution of the liquid it contains. A rough simile to explain the action is found in the fixing salt used by photographers. Reduced to a fine powder this dissolves readily in warm water, but in large crystals it will only dissolve slowly, and if we *boil* the water a chemical action is started which altogether alters the nature of the salt and spoils the solution.

Now with hydrocarbon fuels, *after* we have a *dry* mixture free from globules of liquid, when the fuel is "dissolved" in the air completely, we can heat the whole much hotter without doing any harm to the fuel. It will crack if in liquid form, but will not do so so readily when gaseous. Thus the mechanical mixing of the fan allows the mixture resulting to be rapidly heated to a high temperature, so that it will pass through a long induction pipe without a jacket without condensation taking place. It is even stated that a long induction pipe is an advantage, apparently allowing the gas to improve in some way.

In actual practice there are some rather unusual points in connection with this instrument. First the engine itself runs far cooler than normal and the endeavor is made to keep it at about 130 deg. Fahr. The purpose is to facilitate lubrication as much as possible, and there is no advantage, so it is said, from the fuel viewpoint in running any hotter. The theory is that as long as the gas is hot enough and the mixture good enough to prevent condensation there is nothing gained by heating the engine; on the contrary the lubrication of the pistons is best when the cylinders are fairly cool.

Highly Efficient Under Road Conditions

The first criticism which occurs is, of course, that the effect of the high heating and of the mechanical mixing fan must be to reduce the volumetric efficiency of the engine. This is not denied and it is admitted that an engine will show more power on a dynamometer with a normal carbureter and good gasoline than with the Deppé apparatus, but it is quite truthfully claimed that temperature variations have a profound effect on the power of an engine with normal carbureter equipment and that the drop in volumetric efficiency only takes effect at high speed. On the road, it is claimed, the high temperature gas provides a constant condition which is unaffected by heat or cold, because the atmospheric variation of about 100 deg. makes only a comparatively small percentage

variation in the temperature of the gas in the intake manifold.

The Deppé instrument is not new, having been in development for several years, and it has been applied to many cars of different kinds. One of these, a Buick big six, operates in ordinary town and country driving precisely as though it had a first class carbureter and high-test gasoline, the radiator remaining so cool that the hand can be held against it at the top without the least discomfort. This is with a long copper manifold with thin walls and no heating other than what it receives from the gas.

The carbureter used is practically the standard Stromberg of air valve type. Hot air is taken to both the main air chamber of the carbureter and to the air valve, this being led from the conventional exhaust pipe stove through large flexible pipes. For the outer and inner chambers of the heating box above the throttle, exhaust gas is led in by smaller flexible pipes, and this passes out to the air direct through the small orifices.

Throttle Opens from Center

There is another essential feature of the equipment which has not been mentioned, and this is the throttle, which opens from the center like the iris of a camera lens. The purpose of this is always to have a straight discharge into the heating chamber and past the mechanical mixer; a butterfly throttle causes disturbances which are detrimental to the subsequent stages in making the gas. The throttle is shown in the illustration and is very simple. Essentially it is two segments of a barrel throttle which rotate in opposite directions. From each segment is cut a semicircle, the two together making the full opening and the segments revolve over each other like the blades of a pair of scissors. The two throttle levers are interconnected by a rocking beam so that moving one of them one way moves the other in the opposite direction of rotation.

The Deppé instrument is not at present on the market as an attachment owing, it is claimed, to the great number of sizes and patterns that would have to be carried. It is now planned to use it exclusively on two new passenger cars which will be announced the coming summer, one to sell for about $750 and the other for $1,500, while truck and tractor applications are also under consideration. The licensing of manufacturers of any kind of vehicle is also part of the plan of the new company being formed to handle the Deppé patents.

Not a Kerosene Carbureter

Particular stress is laid on the statement that the Deppé device is not a kerosene carbureter, though it will operate on kerosene. It is intended to handle mixed fuels with both light and heavy fractions including kerosene, gasoline and some oils heavier than kerosene. It is also claimed that mixtures of petroleums with benzole or with alcohol, or mixtures of all three can be handled. As long as there are some light fractions present starting from cold can be performed, but without them a pre-heater is necessary.

Jacobson Light Car Axles Ready

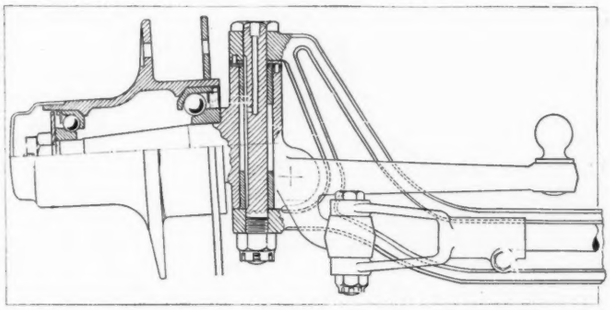
Front Type Has Either Annular or Cup-and-Cone Bearings—Rear Axle Is Three-Quarters Floating

THE Jacobson Machine Mfg. Co., Warren, Pa., has just completed its designs of light passenger car axles and is at present under production with these and ready to supply them to the trade.

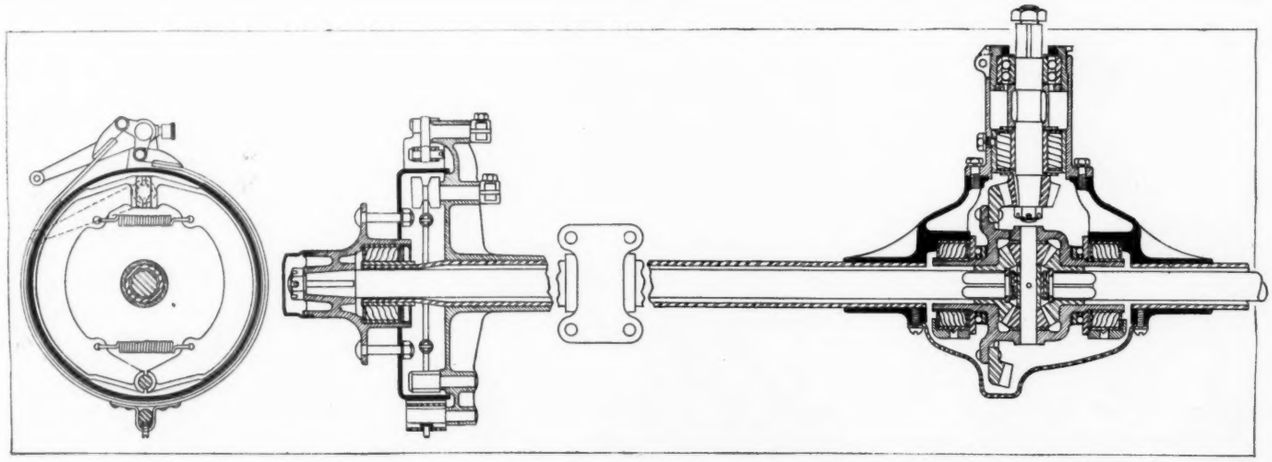
The front axle is of the reversed Elliott type and is furnished with either annular or cup and cone bearings, as well as hubs for wood or wire wheels. The rear axle is three-quarter floating with a malleable center housing and pressed steel cover. Hyatt roller bearings are used in the wheels and on both sides of the differential, as well as in front of the drive pinion. The pinion thrust is taken by a double row annular bearing.

Differential a Two-Pinion Design

The differential is a two-pinion design with a hardened spacing block to keep the pinions in position and to take the side thrust from the axle shafts, which are provided with hardened buttons. To withdraw the axle shafts the differential pinion shaft and the washer which secures the differential gear to the shafts is removed, when shafts can be withdrawn straight through the housing. These shafts are of chrome nickel steel. The standard ratio is 4.5 to 1, and the gears are spiral bevel. Brakes are internal and external, operating on a single drum. This axle is particularly suitable for cars weighing between 2000 and 2400 lb.

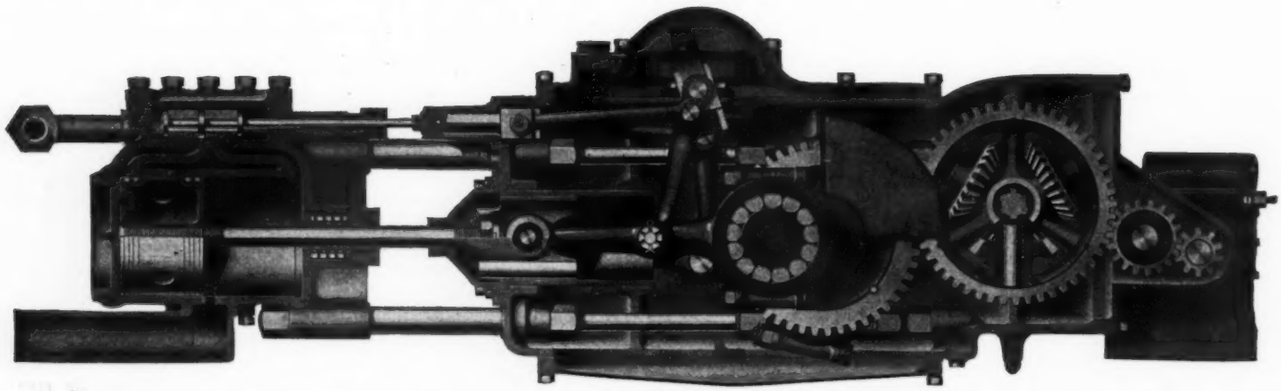


Jacobson Machine Mfg. Co.'s front axle of the reversed Elliott type



Three-quarter floating axle manufactured by the Jacobson Machine Mfg. Co. for cars between 2000 and 2400 lb.

New Burner in Doble Steamer



Section through Doble engine and rear axle. Note direct spur gear drive. The exhaust port is uncovered by the piston toward the end of its stroke. At the right of the illustration the drive of the electric generator is shown

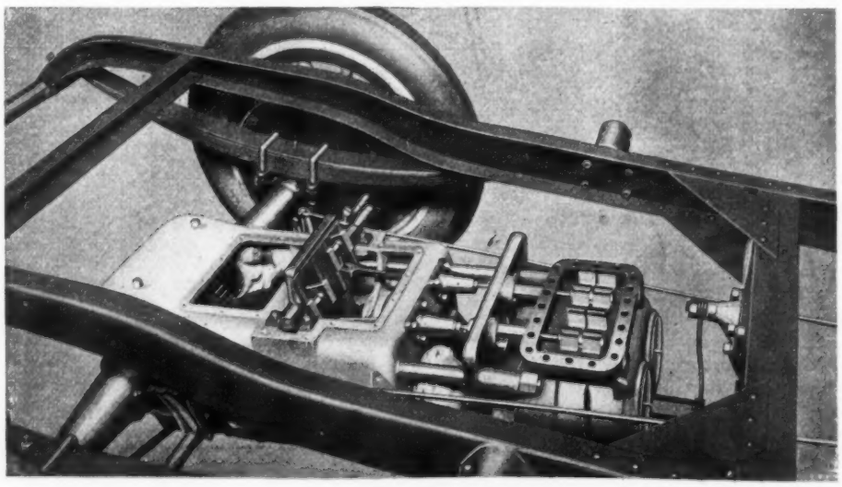
Kerosene Flows by Air Pressure from a Float Chamber—Combustion Now So Complete That No Soot Is Deposited on Generator Tubing

PROBABLY one of the exhibits that attracted the most attention at the recent automobile shows was the Abner Doble steam car. While many of the visitors thought this was a new product, it is in reality a development which has been going on for a number of years. The Doble steam car was first described in THE AUTOMOBILE for April 9, 1914, and again described with its improvements on Sept. 7, 1916. In the past few months, however, a number of further improvements have been incorporated, particularly as regards the combustion chamber.

With this, kerosene is used both for starting and running. The burner is electrically ignited, thus eliminating the pilot light. It is also claimed that with this new system, combustion is so complete that no soot is ever deposited on the generator tubing, and that sufficient steam for running may be generated from cold water in less than a minute. This new burner is so arranged that kerosene flows by air pressure from a float chamber. The pressure head is 3 lb., and the float chamber is the same type as is used in an ordinary gasoline carbureter. This kerosene is fed to a spray nozzle which projects into a venturi tube leading to the combustion chamber. Air, drawn through the venturi by a small electrically-driven blower, passes the spray nozzle with sufficient velocity to draw out the kerosene and break it up into a fine spray. After the venturi opening is passed the velocity decreases, due to the widening of the tube, and at this point the fuel mixture is economized by an electric spark. As soon as the burner is lighted the spark ceases automatically. Combustion takes place in a chamber made of special refractory material for obtaining a very high temperature and insuring complete combustion by heating the gases before they burn.

The hot gases rise, giving up their heat to the generator sections and then pass over a bridge wall and down past the tubes of an economizer where all the heat units possible are abstracted. To stop the combustion it is only necessary to switch off the electric current from the blower. This switching is done either automatically by a regulator set to operate at a different steam pressure or can be done by the operator through a hand switch. It is due to the high temperature obtained in the combustion chamber that steam is generated so quickly in the Doble plant. In other words, a great number of heat units are taken rapidly by means of an unusually large heat surface of the generator tubing and to the high temperature secured. This heat surface is 150 sq. ft. It is stated that most of the time saved in starting as compared with previous means is due to the elimination of the time formerly required for heating the vaporizer preparatory to lighting the main burner.

The greatest disadvantage in steam cars has always been



Rear of Doble steamer chassis, showing mounting of power plant

known as the process of firing up. The burner has generally required preheating. The discovery by Doble that it is possible to ignite kerosene by an electric spark under given conditions is one of the most notable achievements in Doble improvement. The conditions which must obtain in order to secure certain ignition are:

First, a mechanical separation of the kerosene particles into a number of sufficiently small parts to insure a rise in temperature past the point of ignition during the time in which the heat is absorbed from the spark.

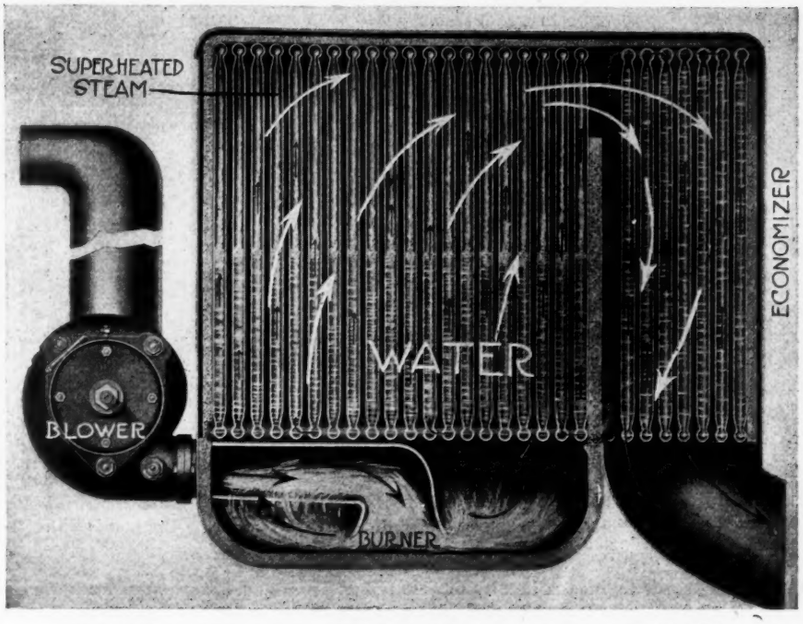
Second, the spark must occur near the atomizing nozzle at a point where the mixture is so dense that one particle of kerosene is ignited by the mixture.

Third, the velocity must be long enough so that the particles will have time to absorb sufficient heat from the spark to exceed the ignition temperature.

Fourth, the mixture must be richer at the point where ignition is to occur than it is for most efficient combustion. The combustion should occur in a refractory chamber so arranged that it retains a high temperature. Complete combustion of a large amount of fuel can then be obtained in a small area.

It is the incorporation of these requirements which have resulted in the improvement of the Doble burning apparatus.

The power units of the Doble steam engine include a steam generator with a combustion chamber and an engine. In addition, there are two supply tanks, one for kerosene and one for water. The Doble steam generator or boiler is fundamentally a water tube type with the water level carried in the evaporating zone. It consists of twenty-eight identical sections placed in an insulated casing. Each casing consists of two horizontal headers connected by sixteen vertical tubes.



Doble boiler. Note the economizer at the right and the firebrick lining surrounding both units

They are made entirely of cold drawn seamless steel tubing of about ½ in. diameter. The vertical tubes are swaged at either end to about ⅜ in. and are welded to the headers by the autogenous acetylene process, thus making the section in effect, one piece of steel, and actually stronger at the welded joints than in the tubing.

Twenty sections are used for the actual generating of steam and the remaining eight act as an economizer. The sections are completely incased, except at the bottom, by a ¾-in. wall of Kieselguhr heat insulating material, and a planished iron jacket. The combustion chamber is directly below the steam generating sections, while the exhaust for burned gases is below the economizer sections. The economizer sections are partially shut off from the remainder of the generator by a bridge wall of Kieselguhr brick, which is virtually an extension of the rear wall of the combustion chamber and extends about three-quarters of the height of the generator.

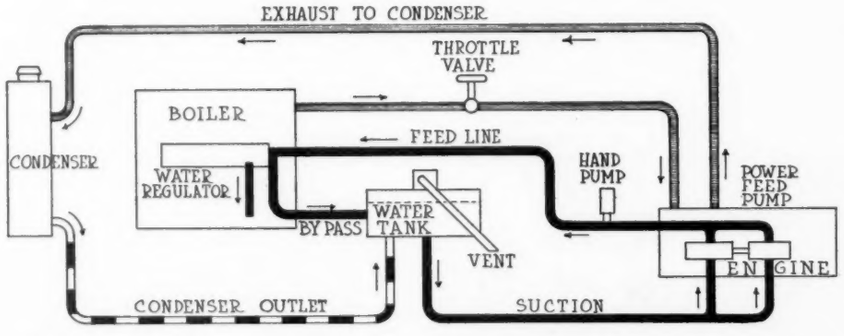
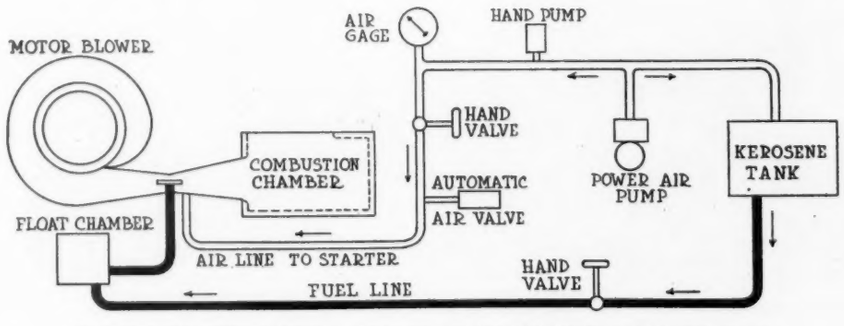


Diagram of the steam and water system, showing method of circulation by gravity and pump

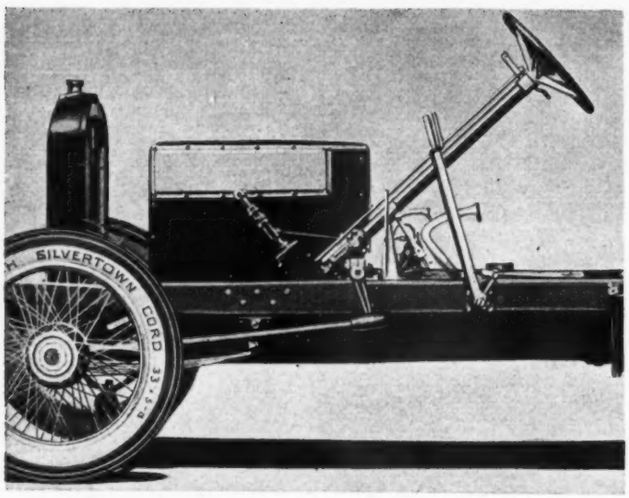


Fuel and air system layout. Pressure in the fuel tank is 2 lb. per sq. in.

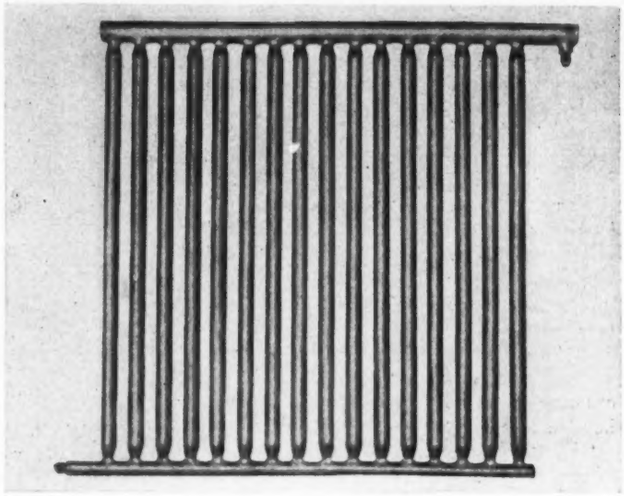
Utilizing Hot Gases

The hot gases rise from the combustion chamber, giving up their heat to the closely grouped vertical tubes, pass over the bridge wall, and a large number of their remaining heat units are given up to the relatively cool water flowing slowly up through the economizer sections.

The intake water manifold delivers water simultaneously to the economizer sections through their lower headers. The water is forced in by a crank-driven plunger pump. When the economizer sections are completely filled, the water overflows from the upper headers into a manifold, which delivers it simultaneously to the lower headers of the evaporating sections. Here the water level is maintained about half way



Front of Doble chassis, showing boiler. Neatness of design is a characteristic feature



One of the twenty-eight sections of tubing which constitute the Doble boiler and economizer

up the generator by means of a by-pass valve, so arranged, that when the regulator tube is filled with steam and consequently hot, the by-pass valve is closed by the expansion of this tube, forcing the water from the pumps to lift the check valve and enter the generator.

As the water level rises the regulator tube is filled with water from an exposed pipe. This water, not being in circulation in the generator, is quite cool, so that the relatively large change in temperature causes the regulator tube to contract, thereby opening the by-pass valve and allowing the water to return to the supply tank.

Normal Steam Pressure 600 Lb.

The progressive flow of the water counter to that of the gases, with no circulatory flow, and the all steel construction with its consequent immunity from leaks due to low water, duplicate the features of the flash type.

The normal steam pressure in the generator, while power is being used, is 600 lb., which means rapid acceleration with the opening of the throttle. Pressure is maintained at this point by an automatic device which cuts off or renews the fuel supply according to the variation of the pressure from normal.

Every section of the generator is tested to withstand an hydraulic pressure of 5000 lb., and the actual bursting point is over 8000 lb.

The live steam is led from the upper headers of the generator into a manifold, passes through the throttle valve, and down to the steam chest of the engine. The exhaust steam from the cylinders is carried to the top of the radiator, and is forced down through it by the pressure of following steam. A honeycomb type radiator is used, thereby obtaining approximately six times the radiating surface of the type which was formerly used on steam cars.

The lubrication of the throttle and cylinder valves, the cylinder walls, the interior of the generator and the water pumps is accomplished by the addition of a small quantity of standard cylinder oil to the water.

The engine used in the Doble power plant is exceedingly simple and contains but eleven moving parts. The dimensions of all the working parts are ample to insure uninterrupted service under maximum conditions of load. It is a two-cylinder, single expansion, double action engine. The uni-flow principle is employed in order to provide the high expansion desirable, with a quiet valve gear and only one valve per cylinder. The valve takes care of the steam inlet, while the exhaust passes out through parts uncovered by the piston at the end of the stroke. It is thus possible to secure cut-off at 5 per cent of the stroke, if desired.

The valve gear is a modified form of the Joy valve gear and eliminates the correcting and anchor links employed in the latter. The rocker guide in the Doble is straight instead of curved.

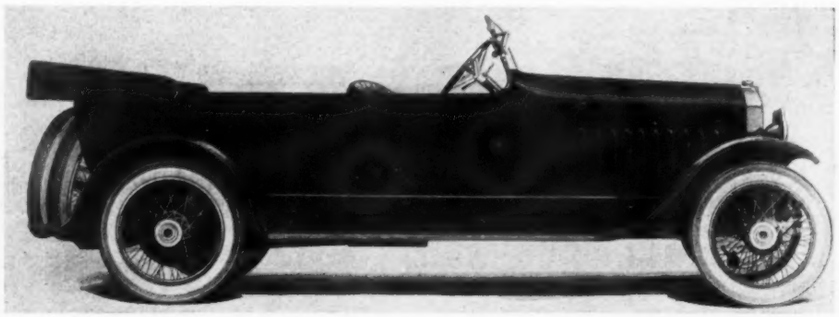
The bore of the cylinder is 5 in.; the stroke, 4 in. A cut-off at 1 in. is used for all ordinary running, and the Doble gear operates this cut-off with perfect accuracy on either stroke of the piston. For starting or heavy pulling a cut-off is used at five-eighths of the stroke; for high speed and economy one-eighth is used.

The power is transmitted to the rear axle by means of two large spur gears, a forty-seven-tooth gear on the engine crankshaft and a forty-nine-tooth gear on the differential. The engine has more torque than is needed to spin the wheels on dry pavement, while the car is held stationary.

The electric generator which charges the storage battery used for lighting and ignition purposes is driven through an idler gear of the spur type, meshing with the main gear of the differential.

Burner Starts Cold in 2 Sec.

A demonstration of the burner apparatus of the Doble car was given a representative of THE AUTOMOBILE at the laboratory in Detroit. The burner was started cold in about 2 sec., the fan blower being started, sending the air through the



Doble steam touring car, which sells for $2,500, including complete equipment. Smoothness of line is a feature of the hood and body design

main venturi and the hand pump then being operated to send a current of air through the starting venturi. Ignition from the spark plug was given instantaneously by small ignition vibrator coil.

The burner gives about a 65-hp. flame, allowing for a thermal efficiency of about 10 per cent. Twenty-four oz. per min. of kerosene are consumed and the calorific value of the fuel is about 18,000 B.t.u. per lb. The current drawn by the fan is 16 amp. at about 2600 r.p.m. This is on a 12-volt circuit. The amount of air put through is 220 cu. ft. per lb. of fuel, while the theoretical amount required for perfect combustion is 190 cu. ft. The fuel used was measured by the representative of THE AUTOMOBILE with a stop watch and amounted to 12 oz. in 30 sec.

An interesting experiment was made to show the safety of the apparatus, the fuel being pumped through the main jets with the primary jets out of commission. A cloud of atomized kerosene was visible above the burner when the starting jet was ignited by the spark plug. There was no resulting explosion, the burner simply lighting as before. The mixture above the burner was not rich enough to ignite. This furnished excellent proof of the system's safety.

Manufacturers' Merchandising

Use Photographs To Aid Sales

"A GOOD photograph is worth a thousand words," said some wise man long ago, and the Studebaker Corp. of America basing its actions on this principle is utilizing photographs to aid its salesmen.

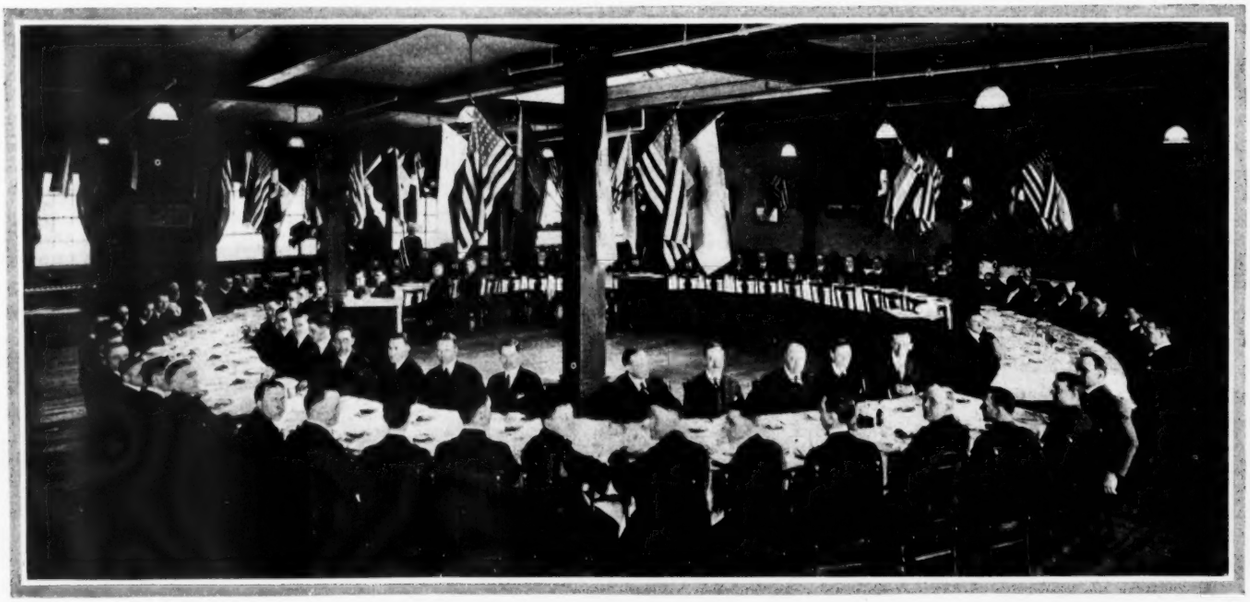
The company has made photographs of its huge organization, of its equipment, methods of production, tests and inspections, and provided its salesmen with binocular glasses. Each of the pictures, of which there are more than 100, is numbered and titled and bears several lines of descriptive matter beneath the scene.

Salesmen attempting to tell customers of the mass of detail, inspection, assembly work and testing of cars must use considerable time, and employ a volume of language combined with a wide range of descriptive phrases. Telling of these things or emphasizing the immensity of the company and its facilities with photographs is a more simple proceeding. Sitting leisurely with a customer, the salesman can show him with photographs every action involved in the manufacture of the car. He can take him from the machine shops to the frame painting department and along from there, step by step, through the various divisions to the final assembly and testing.

He may call on his prospect at his office or his home; he may take him for a demonstration and no matter where he may be, with the binocular glasses, can always take him on a personally conducted tour of the Studebaker plants. The stereoscope portrays vividly the elaborate system of tests and inspections, depicts the operations of the heat-treating plant, shows the twenty-five operations of paint and varnish and in other words informs the prospective buyer of a thousand Studebaker operations for the manufacture of its product, all reasons for enhancing his appreciation of it, of which he would otherwise know nothing.

Selling Without a Demonstrator

This plan cannot help but aid in many instances. It is certain to impress the buyer with the stability of the Studebaker product. Through its adoption, many dealers and salesmen have found a very effective method of increasing winter business. One salesman sold nine cars this past winter with a horse and sleigh by driving into drifts impassable to automobiles, and calling on farmers with nothing but his binocular glasses, photographs and order book.



Over 100 heads of departments of the Chalmers Motor Co. and their assistants gathered at luncheon in the factory cafe to organize the Officers Club of the Chalmers Motor Co.

Reducing Labor Turnover by Insurance

Employee Benefits by Long Tenure Under Fell System—Company and Worker Support Common Pension Fund

Fell Insurance-Plan Features

1—Both company and employee contribute.

2—Company pays more and employee gets more as latter's term of service lengthens.

3—Manufacturer is relieved of pension and deathbed obligations to worker, and has a system tending to reduce labor turnover.

4—Employee has pension fund, life insurance, emergency loan fund, increasing in value each year.

5—Plan is administered by committee of employees.

RESTLESSNESS among employees is one of the predominant features of war time industrial conditions. Encouraged by the reports of high wages and comparatively indifferent to the future because of the labor scarcity, workers are increasingly less loyal to one concern.

The automobile industry is an especial sufferer from this condition which affects manufacturing in general. The development of new motor car companies and the drain upon the skilled-mechanic supply caused by the manufacture of munitions make it more and more difficult to reduce labor turnover.

Various plans have been adopted to reduce shifting in the working force. Modern buildings, better housing and health conditions, profit-sharing plans, guaranteed graduated wages, "blanket" insurance policies are among the many inducements which the manufacturer is offering. Although the worker may make certain gains by changing from one factory to another, the benefits accruing from such a course soon reach a maximum. The result is that the employer who recognizes the independence of his employees, affords them good working conditions and satisfactory wage attractions, secures and retains the highest type of worker.

Various Types of Insurance

An insurance pension plan which aims to reduce labor turnover by making it gainful for the employee to remain in long service with one company has been worked out and put into operation by Herbert N. Fell of Fell & Co., New York. The system differs from the usual type of industrial insurance in certain important respects.

Most industrial insurance policies, for instance, are planned to cover accident, sickness, death or old age without regard to the holder's term of employment in any particular factory. Where the manufacturer takes out a "blanket" policy on his working force the reduction of labor turnover is a probable by-product. If an employee insures himself with the normal type of policy the action has no definite relation to his employment in any one organization.

Joint payment by manufacturer and worker is then the feature of the Fell plan, which provides for old age and other times of need. The joint-payment factor makes continuance of relations between the manufacturer and the worker essential to the working out of the plan, so that the system is in essence turnover insurance with the granting of pensions, death, accident, and sickness features as a by-product.

Preliminary to the paying in of any funds, under the Fell plan, an association is formed in the factory composed entirely of employees. The membership is divided into departments, each department selecting its own local secretary. The local secretaries select the board of directors for the insuring system, and the directors appoint such standing committees as may be required. This type of organization is adopted to put the control of the plan in the hands of the employees.

Each worker pays a flat rate of 5 per cent of his wages into the insurance fund. The employer contributes to the same fund on a graduated scale which hinges upon the length of time the employee has been with the company. The man who is a new employee pays a larger amount than the manufacturer, but the converse becomes the case as the term of service lengthens. The worker is paid for his investment by the various insurance privileges to be described, and the manufacturer by the saving of waste in changing the personnel of the force.

The men are divided into 5-year groups. The employer pays into the fund 1 per cent of the wages of those who have been with the company less than 5 years, 2 per cent in the case of those who have been employed from 5 to 10 years, and so on. The following table shows the schedule:

Years' service of employee:	1–5	5	10	15	20	25	30	35	40
Percentage of employee's wages paid into insurance fund by the company	1%	2%	3%	4%	5%	6%	7%	8%	9%

Saving for Manufacturer

Inasmuch as the employer has no actual cash claims on the fund and derives therefore no direct financial benefit, his payments from the first year represent 20 per cent interest on the total invested, and constantly increase. A large number of employee's privileges can therefore be paid for under this system.

The easiest way to see how the plan works is to take a typical case. A young man starts work with a company when he is 20 years old. He gets $18 a week, and retires at 65 years of age. Without figuring that the young man might get a raise during 45 years of service, his financial situation from time to time is as follows:

He will have paid in $234 at the end of the fifth year. For this he gets: 1—A life insurance policy for $2,217 during the period. 2—The right to borrow $168 in case of sickness at the end of the fifth year. 3—A surrender value of his contract of $126.

At the end of 20 years the privileges are proportionately much greater, due to the compound interest which the money may have earned and the graduated scale of payments for the employer. The young man at the age of 40 then has paid in $936.

He is carrying a life insurance policy worth $2,977, can borrow in case of sickness $1,268, or surrender the contract for $1,008 cash.

When this employee has reached the age of 65 he can retire from active service with a pension of $677 a year for the rest of his life, and if he should die before he had received the pension for 10 years it will nevertheless be paid until a 10-year period has elapsed to his estate. In lieu of a pension he may have a paid-up insurance policy of $7,341, and may withdraw this sum if he so desires.

The young man during his life has certain other privileges. A sickbed benefit is provided in the borrowing clause. The borrowing power is limited to such emergencies and the

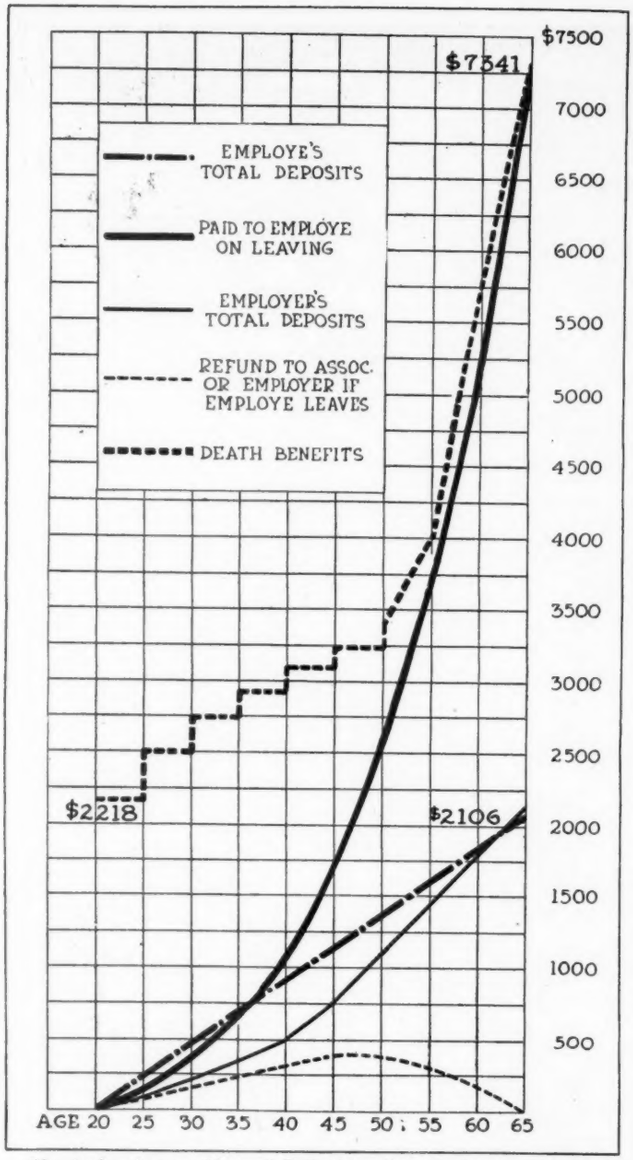


Chart showing working of Fell plan when employee enters at 20, wages $18

worker is obliged to pay back only half what he has borrowed. Since there is a limit on the size of the loan determined by the amount of premiums paid in, the sick benefit depends in reality also upon the term of service with the company. If he leaves the company's employ his contract, as indicated, has a cash-surrender value and the remainder of the deposits under his contract reverts to the association or employer, as the arrangement may be.

In case of total disability the policyholder gets a fully paid-up contract with privileges increasing in the same ratio as though he were at work with the company.

The manufacturer's gain from this financial output is evident in a number of particulars. Statistics show, according to Mr. Fell, that it costs the average employer at the least $45 to hire and educate every man he takes into his employ each year.

Added to the cost of the employment department is the loss in team work and efficiency occasioned by the too great introduction of new men. A force of men who have served for several years with the company compared with a shifting force produces a greater output from the same equipment, a better quality of work, requires less inspection, and insures a better maintenance of schedules.

Produces Greater Efficiency

Further than this, many employers are now taking some plan of insuring their men against sickness, accident, death, and old age. The reason for this is two-fold: because maximum efficiency cannot be maintained if the worker is worried over financial difficulties, because the manufacturer is coming to realize that the faithful employee has a legitimate lien on the industry.

When this plan is put into operation the employees are immediately classified according to the time they have been in the company's service. A man who had already served 30 years would start, for instance, paying 5 per cent of his wages, whereas the employer would pay 7 per cent of the amount of this worker's pay into the system. The system when instituted is made retroactive, for if it were not the older men in the industry would not have a chance to obtain the maximum benefits.

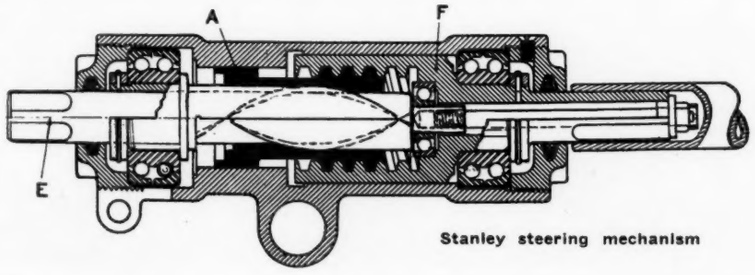
Success in any system depends partially upon the spirit in which the contracting parties enter into it. The value of any plan may also be affected by the qualifying provisions with regard to strikes, lay-off of labor in slack periods, and other abnormal circumstances. These clauses cannot be introduced in a general description, as each factory has to adjust such matters for itself in adopting any extensive plan.

Stanley a Unique Steering Gear Mechanism

IT is not often that an entirely new type of mechanism appears for such a well established article as a steering gear, but T. D. Stanley, General Service Engineers Co., Detroit, has a design which is entirely novel. The shaft to which the steering arm is attached is in line with the steering wheel shaft and is turned at a slower speed in the steering wheel by the use of an irreversible connection.

Referring to the illustration, the part *A* is capable of sliding up and down in the case and cannot turn therein. Inside the nut fits the shaft *E* to which the steering arm is attached. This shaft has cut on it a portion of a screw thread of very long pitch. The inside of the nut *A* is machined to fit this. Thus, as the nut travels up and down the shaft *E* turns back and forth. *F* is a nut secured to the bottom of the steering column, so that turning the wheel produces the required sliding movement on *A*. Screwing in the plug at the end of the case tightens up the bearings simultaneously and, it is stated, compensates for any wear that may take place at any part of the gear.

This mechanism was designed with a view to the practical requirements of everyday service.



Stanley steering mechanism

Annual Banquet of the Aero Club of America Held March 30 at the Waldorf-Astoria—525 in Attendance

Foreign Trade Department

Scandinavian Countries Fertile Sales Field for U. S. A. Cars and Accessories—Some Makers Injure Reputations and Endanger Future Business by Shortsighted Methods

SCANDINAVIA, including the countries of Denmark, Sweden and Norway, as a whole, forms a fertile field for sales of American automobiles and accessories, states a prominent exporter, with offices in New York, who has been doing a large business in these countries for a number of years. Though many sales of our cars have been made there, they could be improved if more attention were given by our manufacturers to small but important details. That the dealers there have just cause for complaint, especially in the small car field, is manifested in the complaints that have been made in regard to the shipments of these cars. There is, for instance, a fairly good demand in Denmark for our cars selling around $900, but this trade has been hurt considerably and the reputations of the manufacturers have been damaged on account of the poor condition of the accessories and parts sent over on these cars. According to information brought to the attention of this exporter, several car manufacturers substituted second-hand starters, which later proved troublesome and caused the owner to become prejudiced against American cars.

American makers, in order to compete with European competition after the war in the Scandinavian countries must be willing to meet the demands of the people. For example, there is a big demand for right-hand drive and the makers have been asked to change these foreign shipments accordingly. The result has been that the dealer has been charged $25 extra in some cases, and in others the makers won't touch the order.

Battery Charging Facilities Poor

At the present time there are no facilities for charging batteries such as are used on the American cars, and as a result the people have stuck to the magneto, with which they are familiar. Naturally with a scarcity of charging facilities a demand for magneto-equipped cars is to be expected. But notwithstanding these conditions and the specified demand, a majority of the cars shipped there are minus magnetos. These complaints are justified and our makers must take care of this demand.

It must be remembered that there is a big demand for our cars there and there will be a larger one at the cessation of the war, providing we can overcome the prejudice which has sprouted up as a result of our apparent carelessness. It must also be remembered that the present demand for accessories, etc., which are now in common use in the United States, will not be apparent when normal conditions return. Great Britain's strict censorship on the shipment of cars and tires into these countries has caused a big shortage of tires. This condition has existed for the past 2 years and has resulted in a dearth of straight side tires and an abundance of clincher types. Consequently a demand for the clincher has been specified in all orders for American cars and, as in the other cases, no attention has been paid to the order.

As was stated, there is a big demand for cars selling around $900, but with the present freight and war risk insurance rates, these prices are raised nearly 50 per cent higher than the wholesale price. The buyers naturally expect cars to give fairly good service, and when they fall down, as reported, the American small car maker has something to worry about in regard to future sales.

The farming element has always been prejudiced against the automobile, and has been instrumental in introducing much adverse automobile legislation, especially in Denmark. Conditions are improving there, however, as the farmers are fast being won over to the motor-driven vehicle. Parliament is expected to increase the speed limit to 31 m.p.h. on highways and 15½ m.p.h. on the open city streets.

When the war started a large number of the population started manufacturing canned meats for the belligerents and became suddenly wealthy, especially in Denmark. This resulted in the sale of many cars, especially in the high-priced field. It is stated that a second-hand Rolls-Royce brought $11,000 shortly after the beginning of hostilities. There was a big demand for distinguished or classy cars. Speculation in shipping stock in Norway was responsible for much sudden wealth. Norway engaged in a very large shipping business at the outset of the war, being fourth in the commercial fleets of the world. This country is rugged and mountainous and has good roads. Though there are fewer buyers than in Sweden and Denmark there is a demand for big cars.

There is a big demand for smart-looking cars in Sweden, though at the present time this has decreased considerably on account of the blockade by Great Britain. The Swedish nation is of an independent character and does not take kindly to the red tape and routine through which they are forced when a car is bought. An idea of the difficulties to be overcome in shipping cars from the United States to the Scandinavian countries may be gained by reviewing a shipment of cars from New York, say to Denmark. The Merchants' Guild in Copenhagen gives a declaration for orders which have to be viséed by the British Consul and by the Automobile and Cycle Merchants' Assn. The matter then goes to the Scandinavian-American shipping line, which cables to the agents in New York who handle its shipping from this country. These agents then notify the exporter what accommodations can be obtained for shipping the cars, giving ship, date, etc. It is then necessary for the exporter to write to the British Embassy at Washington, giving complete details of the order and describing all matter to be shipped thereunder, and also giving the names and addresses of consigner, consignee, etc. Upon receipt of an assurance for the goods and a permit from the British Embassy the cars can then be placed on the dock, after which shipment is a mere matter of routine with the steamship company.

To Assemble Cars Using U. S. A. Parts

The difficulty in getting cars from the United States has led to a demand for second-hand English cars and a movement towards the manufacturing of cars in Scandinavian countries. There are at present in Denmark about ten companies which are ready to start manufacturing automobiles. One big feature of this movement is that a majority of the companies will use American parts and will assemble them on the other side, thus saving heavy overhead expense and getting standardized parts. Many inquiries have been received by our exporting houses for these parts.

Automobile Calendar

CONTESTS
1917

April—Los Angeles to Salt Lake City Road Race.
May 10—Uniontown, Pa., Speedway Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Uniontown, Pa., Speedway Race.
June 9—Chicago, Ill., Speedway Race, Championship.
June 23 — Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Uniontown, Pa., Speedway Race.
July 4—Tacoma, Wash., Speedway Race, Championship.
July 14 — Des Moines, Iowa, Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Aug. 18—Elgin, Ill., Road Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15 — Providence, R. I., Speedway Race, Championship.
Sept. 29—New York Speedway Race, Championship.
Sept. 30—Uniontown, Pa., Speedway Race.
Oct. 6—Kansas City Speedway Race.
Oct. 6—Uniontown, Pa., Speedway Race.
Oct. 13 — Chicago Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

March 31 - April 14 — Atlantic City, Garden Pier. S. W. Megill, Mgr.
April—Milwaukee, Wis., Spring Show, Milwaukee Automobile Dealers.
April 3-7—San Francisco, Commercial Car Show, Exposition Auditorium. I. R. Gates, Mgr.
April 4-7—Stockton, Cal., Second Annual, San Joaquin Auto Trades Assn. Samuel S. Cohn, Mgr.
April 11-14 — Calumet, Mich., Show, Upper Peninsula Show Assn.
April 20-26 — Milwaukee, Wis., Used Car Show, Milwaukee Automobile Dealers, Auditorium.
Sept. 2-9—Spokane, Wash., Interstate Fair.
Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.
Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.

S. A. E. Calendar

Standards Division Meetings

APRIL

13—Lighting, Cleveland, at National Electric Lamp Works.
11—Nomenclature.
13—Electrical Equipment, New York.
18—Starting Battery, Detroit.
19—Tire & Rim, Cleveland.
19—Marine Starters, New York.
20—Aeronautic, New York.
25—Springs, New York.
29—Research, New York.

MAY

2—Transmission, Detroit.
3—Standards Committee, Cleveland.
6-7—Research, Indianapolis.
9—Tractor, Chicago.
16—Ball and Roller Bearing, New York.
18—Truck Standards, New York.
22—Lighting, Cleveland.
25—Aeronautic, New York.
25—Miscellaneous, Detroit.

JUNE

5—Starting Battery, Detroit.
7—Engine, Detroit.
8—Transmission, Detroit.
14—Electric Vehicle, New York.
18—Standards Committee.

Section Meetings

APRIL

13—Detroit, Technical meeting, paper by N. W. Akimoff on Spring Suspension.
14—Mid-West — Devoted to a symposium on carburetion with talks by F. C. Mock of Stromberg Motor Devices Co. and H. L. Horning of Waukesha Motor Co., and a written communication from Dr. Burton, vice-pres. Standard Oil Co.
19—Metropolitan, Driving the Car Magnetically, a paper on the Owen system by W. Goll. A paper on the Woods system by W. Kennedy.
20—Cleveland—Hollenden Hotel. Automobile Engine Cooling, A. K. Schanze of Pitter Fan Co.
26—Pennsylvania, Problems Involved in Ignition Development, W. A. Evans, Research Engineer, Atwater Kent Mfg. Works.
30—Detroit — Annual business meeting.

MAY

17—Metropolitan, Engines that Will Burn the Fuels We Shall Have to Use. Papers by H. G. Chatain on the Diesel and P. O. Scott on the Junker.

Engineering Calendar

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automobile Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architects and Marine Engineers.

APRIL

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
10—Amer. Soc. Mech. Eng., New York. Standards of Business Success, Earl Buckingham. "Get Acquainted" supper, Hotel Navarre, 6.15 p. m.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
12—Illum. Eng. Soc. New York section. Projectors, C. A. B. Halvorsen, a paper on industrial appliances.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
19—Mining & Met. Soc. of Amer. monthly meeting New York section at Engrs. Club.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
17—Mining & Met. Soc. of Amer. monthly meeting New York section at Engrs. Club.
18—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
19—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
21—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21-24—Amer. Soc. Mech. Engrs. Spring meeting in Cincinnati. Joint session May 22 with Nat. Mach. Tool Bldrs. Assn.
29—June 1 — Nat. Elec. Light Assn. Convention at Atlantic City.

MAY

5—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Soc. for Elec. Development annual meeting.
12—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
15—Illum. Eng. Soc. Pittsburgh section, Office Building, Lighting and Inspection Trip through City and County Building. Mr. S. G. Hibben.
16—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
18-19-20 — Master Car Bldrs. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqts. Marlborough-Blenheim Hotel.
21—Mining & Met. Soc. of Amer. New York section monthly meeting at Engrs. Club.
26-30—Amer. Soc. for Test Mat. annual meeting Atlantic City.

JUNE

2—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
5-7—Nat. Gas Engine Assn. annual meeting at Chicago (Sherman House).
8—Amer. Soc. Heat & Vent. Engrs. monthly meeting Ohio section at Cleveland.
9—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13-14-15 — Amer. Ry. Master Mech. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrs. Marlborough-Blenheim Hotel.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

JULY

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburg section.

AUGUST

4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
11—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
20—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

SEPTEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10-14—Assn. Iron & Steel Elec. Engrs. annual convention at Phila.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
14—Amer. Soc. Heat & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.